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ABSTRACT

One of two individualized courses included in a drafting curriculum, this course is designed to introduce the student to a variety of blueprints and techniques for obtaining information from them. The course is comprised of four units: (1) Introduction to Building Trades Blueprint Reading, (2) Blueprint Reading for Carpentry, (3) Blueprint Reading for Plumbing, and (4) Blueprint Reading for Sheet Metal. Each unit begins with a Unit Learning Experience Guide that gives directions for unit completion. The remainder of each unit consists of Learning Activity Packages (LAP) that provide specific information for completion of a learning activity. Each LAP is comprised of the following parts: objective, evaluation procedure, resources, procedure, supplemental sheets, study guide, and a LAP test with answers. The course is preceded by a pretest which is designed to direct the student to units and performance activities. (LRA)

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MOUNTAIN PLAINS LEARNING EXPERIENCE GUIDE:

Drafting

Course: Blueprint Reading.

CE027786

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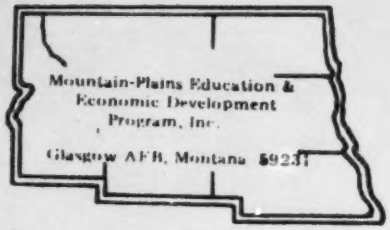

Learning Experience Guide

COURSE: BLUEPRINT READING

DESCRIPTION:

Blueprint reading is a course designed to introduce the student to a variety of blueprints and techniques for obtaining information from them. The course is complementary to occupational training in other areas that require blueprint reading skills.

RATIONALE:

People in our society who build or modify things already constructed do so by following carefully designed plans or blueprints. Blueprints use symbols, abbreviations and lines to show ideas that are difficult to describe completely with words. Reading blueprints means obtaining information about how to make things from drawings.

PREREQUISITES:

1. Communication Skills at or above level 1.
2. Math Skills at or above level G.

RESOURCES:

A course resource list is attached.

OBJECTIVE:

Given a set of blueprints, the student will interpret and obtain desired information from the prints.

GENERAL INSTRUCTIONS:

This course has four units. Each unit has a Unit Learning Experience Guide (LEG) that gives directions for unit completion. Each unit consists of Learning Activity Packages (LAPs) that provide specific information for completion of a learning activity. Pretesting results direct the student to units and performance activities.

Principal Author(s): C. Schramm

The general procedure for this course is as follows:

(1) Read the assigned unit LEG for this course.
(2) Begin and complete the assigned LAPs for the unit.
(3) Take the unit tests as described in the Unit LEG "Evaluation Procedures:.
(4) If you are assigned more than one unit go to Step 5. If you are not you have completed activities in the Blueprint Reading Course.
(5) Follow Steps 1 through 3 for the remaining units.

You will work independently unless directed to do otherwise. When questions or problems arise, you are expected to discuss them with the instructor.

UNIT TITLES:

.02 Introduction to Building Trades Blueprint Reading
.03 Blueprint Reading for Carpentry
.04 Blueprint Reading for Plumbing
.05 Blueprint Reading for Sheet Metal

EVALUATION PROCEDURE:

Course evaluation is by pre and post testing using a multiple-choice type of test.

In this course, the course test is used as a pretest to determine which units, if any, the student may be able to validate. The student is considered validated for a particular unit if 4 out of 5 items are correctly answered for each LAP part on the course pretest.

The course test will also be taken by the student as a post test to determine any changes resulting from taking all or part of the course.

FOLLOW-THROUGH:

This course is designed as support to occupational preparation for the building trades. Begin working now on the first unit of this course that is prescribed for your preparation program.

RESOURCE LIST

Printed Materials

1. Blueprint Reading and Sketching for Carpenters - Residential. McDonnell and Ball, Delmar Publishers, 1975.
2. Blueprint Reading for Plumbers Residential and Commercial. Delmar Publishers, 1973.
3. Building Trades Blueprint Reading and Sketching. Delmar Publishers, 1974.
4. Sheet Metal Blueprint Reading for the Building Trades. Delmar Publishers, 1971.

Audio/Visuals

none

Equipment

1. Compass.
2. Dividers.
3. Protractor.
4. Scale, architect.
5. Scale, engineer.
6. Templates, ellipse.
7. Triangles (30^{o} x 60^{o} & 45^{o}).

8/14/75

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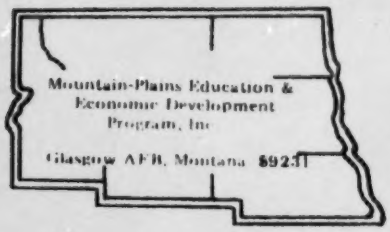

Learning Experience Guide

UNIT: INTRODUCTION TO BUILDING TRADES BLUEPRINT READING

RATIONALE:

People, who work in the building trades, perform their tasks by following blueprints. This unit introduces the student to the kinds of information presented on building trade blueprints and how to interpret the symbols, abbreviations, and lines.

PREREQUISITES:

1. Communication Skills at or above level G.
2. Math Skills at or above level I.

RESOURCES:

Printed Material

Building Trades Blueprint Reading and Sketching. Delmar Publishers.

Equipment

Compass
Scale, architect
Templates, ellipse
Triangles (30^0 x 60^0 & 45^0)

OBJECTIVE:

Obtain information about methods and materials used in basic structures, from building trades blueprints.

Communicate basic building construction information by sketching.

GENERAL INSTRUCTIONS:

This unit consists of 28 Learning Activity Packages (LAPs). Each LAP will provide specific information for completion of a learning activity.

Principal Author(s): C. Schramm

General Instructions: Continued

The general procedure for this unit is as follows:

(1) Read the first assigned Learning Activity Package (LAP).
(2) Begin and complete the first assigned LAP.
(3) Proceed to and complete the next assigned LAP until the unit is completed.
(4) Take the unit tests as described in the Unit LEG "Evaluation Procedures".

PERFORMANCE ACTIVITIES:

.01 Introduction to Blueprint Reading
.02 The Working Drawing
.03 Placement of Views
.04 Dimensioning a Working Drawing
.05 Invisible Edges
.06 Circles and Arcs
.07 Views in Section
.08 Tools for Sketching
.09 Sketching Straight Lines
.10 Sketching Circles, Arcs, Irregular Shapes
.11 Making a Working Sketch
.12 Isometric Sketching
.13 Sketching Angles in Isometric
.14 Dimensioning an Isometric Sketch
.15 Sketching Circles and Arcs in Isometric
.16 Sketching an Irregular Shape in Isometric
.17 Oblique Projection
.18. Structural Members of a Frame Structure
.19 Roof Framing, Doors and Windows
.20 Frame Buildings
.21 Doors, Windows and Exterior Walls
.22 Framing Plans and Evaluations
.23 Rough Openings, Roofs, Roof Framing
.24 Plans, Elevations and Sections
.25 Details and Sections
.26 Piers and Floors
.27 Windows, Lintels, Doors
.28 Wall Plates, Roofs, Rafters

EVALUATION PROCEDURE:

When pretesting and post testing:

The student takes the unit multiple-choice pretest.
Successful completion is 4 out of 5 items for each LAP part of the pretest.

FOLLOW-THROUGH:

Go to the first assigned Learning Activity Package listed on your Student Progress Record (SPR).

Student: _____ File Code: 79.02.02.00 A2-2

Date: _____ Date Published: 11-18-74

Revised: 12-04-78

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

PRE/POST TEST: INTRODUCTION TO BUILDING TRADES BLUEPRINT READING

Using the blueprint for the two car brick garage answer the following questions:

1. Building of this type are called:

   a. brick.
   b. frame.
   c. stone.
   d. brick veneer.

2. The floor plans and elevations are drawn:

   a. 1" = 1' 0"
   b. 1/4" = 1' 0"
   c. 1/4 full scale.
   d. 1/2" = 1' 0"

3. A common brick measures:

   a. 2-3/4" x 3-3/4" x 4".
   b. 2-3/4" x 3-1/4" x 8".
   c. 2-1/2" x 3-1/3" x 8".
   d. 2-1/4" x 3-3/4" x 8".

4. The overall length of the rear brick wall is:

   a. 24' - 0"
   b. 21' - 6"
   c. 21' - 4"
   d. 24' - 1"

5. Section C-C is drawn:

   a. 1/4 full scale.
   b. 1/4" = 1' 0"
   c. 1" = 1' 0"
   d. F.S.

6. The brick wall is 2 bricks wide; its thickness is:

   a. 9"
   b. 6"
   c. 12"
   d. 8"

7. The face of the foundation wall is set:

   a. 2" inside the brick wall.
   b. 1" outside the brick wall.
   c. flush with the brick wall.
   d. 2" outside the brick wall.

8. The masonry work between the double door opening is called a:

   a. column.
   b. pier.
   c. flat arch.
   d. wall.

9. In a rowlock course, the face of the brick exposed would be:

   a. its bottom.
   b. its end.
   c. its top.
   d. its side.

10. The distance from the grade line to the first brick course is:

   a. 4' 0"
   b. 4"
   c. 6"
   d. 14"

11. The thickness of the concrete wall above grade is greater than the brick wall by:

   a. 2"
   b. 0"
   c. 1"
   d. 3"

12. A brick with its long edge laid horizontally is called a:

   a. header.
   b. soldier
   c. stretcher.
   d. rowlock.

13. The fill under the garage floor is specified as:

   a. gravel.
   b. cinder.
   c. sand.
   d. concrete.

14. The number of collar beams called for is:

   a. two.
   b. one.
   c. three.
   d. four.

15. The floor:

    a. pitches 1" to each side.
    b. pitches 2" to the front.
    c. pitches 2" to center.
    d. is level.

16. If the left elevation were drawn, it would show:

    a. four doors.
    b. no openings.
    c. two windows.
    d. one door.

17. The top of the single door:

    a. is not indicated on the plan.
    b. is the same height.
    c. is higher than the double door.
    d. is lower than the double door.

18. The brickwork over the single door is called:

    a. a header course.
    b. a stretcher course.
    c. a soldier course.
    d. a rowlock course.

19. The brickwork directly below the plate is called:

    a. a soldier course.
    b. a header course.
    c. a rowlock course.
    d. a stretcher course.

20. The type roof shown is classified as:

    a. gambrel.
    b. gable.
    c. flat.
    d. hip.

21. The pitch of the roof is:

    a. 5" rise to 12" run
    b. 5" run to 12" rise
    c. 10" run to 24" rise
    d. 10" rise to 12" run

22. The number of common rafters required for this building are:

    a. 10.
    b. 6
    c. 4
    d. 8

23. The size of the hip rafters are:

    a. 2" x 8".
    b. 2" x 4".
    c. 2" x 10".
    d. 2" x 6"

24. The arrangement of rafters is shown:

    a. on the section.
    b. on the elevations.
    c. on the floor plan.
    d. on the roof framing plan.

25. The spacing of the common rafters is:

    a. 12" O.C.
    b. 18" O.C.
    c. 16" O.C.
    d. 24" O.C.

26. The number of lines required to indicate the width of plate and thickness of brick wall on roof framing plan would be:

    a. 1
    b. 3
    c. 2
    d. 4

27. The number of down spouts indicated is:

    a. 1
    b. 3
    c. 4
    d. 2

28. The timber laid upon the top of the finished brick wall to seat the rafters is called:

    a. plancher.
    b. plate.
    c. sill.
    d. stud.

29. The drawing marked C-C indicates:

    a. a door schedule.
    b. a hidden plane.
    c. a plan.
    d. a vertical section.

30. The section taken through the single door opening is referred to as section line:

    a. A.
    b. B.
    c. B-B.
    d. A-A.

31. The sections are drawn to a scale of:

    a. 3/4" = 1' 0"
    b. F.S.
    c. 1" = 1' 0"
    d. 1/4" = 1' 0"

32. Over the large door openings there is a:

    a. sill.
    b. lintel.
    c. truss.
    d. plate.

33. Over the large door openings there is:

    a. a double plate.
    b. no plate.
    c. a triple plate.
    d. a single plate.

34. The window sills are laid as:

    a. header course.
    b. stretcher course.
    c. soldier course.
    d. rowlock course.

35. The member of the cornice which is nailed to the ends of the rafters is called the:

    a. frieze.
    b. plancher.
    c. facia.
    d. soffit.

36. The type gutters called for are of:

    a. wood.
    b. tile.
    c. copper.
    d. galvanized steel.

37. The walls of the garage are laid in:

    a. stretcher bond.
    b. flemish bond.
    c. common bond.
    d. English bond.

38. The soffit is nailed to the:

    a. wood gutters.
    b. frieze.
    c. bottom of the rafters.
    d. rafter ends.

39. The lintel over the window is composed of:

    a. three 2" x 6".
    b. 4" I beam.
    c. two Ls.
    d. two 2" x 6".

40. The foundation wall was carried 4' 0" below the grade line:

    a. to be below the frost line.
    b. because of the sandy condition of the soil.
    c. because of the heavy weight of the brick wall.
    d. to keep the building from settling.

41. The symbol S^3 controls:

    a. a single light.
    b. three lights.
    c. two lights.
    d. all the lights.

42. What is the overall length of the side wall?

    a. 24' 1"
    b. 21' 2"
    c. 17' 7"
    d. 22' 8"

43. The thickness of the apron footing is:

    a. 8"
    b. 10"
    c. 15"
    d. 12"

44. The 5/8" x 18" anchor bolts are to be spaced:

    a. 5' 0" O.C.
    b. 7' 2" O.C.
    c. 5' 6" O.C.
    d. 6' 0" O.C.

45. What are the downspouts made of:

    a. tin.
    b. wood.
    c. galvanized steel.
    d. aluminum.

46. What is the total rise of the roof?

    a. 6' 4"
    b. 4' 9½"
    c. 5' 0"
    d. 10' 0"

47. What size crown moulding is shown in the cornice detail?

    a. 3/4" x 1-3/4"
    b. 3/4" x 2-3/4"
    c. 1" x 1-3/4"
    d. 3/4" x 3/4"

48. The symbol S^1 controls:

    a. a single light and one wall plug.
    b. a single light.
    c. two lights.
    d. two lights and one wall plug.

49. How many wall plugs are called for?

    a. 1
    b. 2
    c. 3
    d. 4

50. What size plancher is shown in the cornice detail?

    a. 3/4" x 1-3/4"
    b. 13/16" x 6-1/2"
    c. 13/16" x 4-1/2"
    d. 13/16" x 6-1/4"

Revised: 12-04-78

PRE/POST TEST ANSWER KEY

Occupational Area: Drafting
File Code: 79.02.02.00 A2-2
Name: _____
Family Pay Number: _____ Sex: M F (Circle 1)

ANSWERS

1. A	21. A	41. A
2. B	22. D	42. D
3. D	23. A	43. D
4. D	24. D	44. D
5. C	25. C	45. C
6. D	26. B	46. B
7. B	27. D	47. A
8. B	28. B	48. B
9. B	29. D	49. B
10. D	30. C	50. B
11. C	31. C	51.
12. C	32. B	52.
13. B	33. B	53.
14. C	34. D	54.
15. B	35. C	55.
16. B	36. A	56.
17. D	37. A	57.
18. C	38. C	58.
19. C	39. A	59.
20. D	40. A	60.

Student: _____ File Code: 79.02.02.00 B2-2

Date: _____ Date Published: 3-9-78

Family Education Program

UNIT POST TEST: INTRODUCTION TO BUILDING TRADES
BLUEPRINT READING

Using the blueprint for the one car frame garage; answer the following questions:

1. Buildings like this one-car garage are called:

   a. brick veneer.
   b. brick.
   c. frame.
   d. stone.

2. The section at A is drawn to:

   a. full scale
   b. 1" - 1'0"
   c. quarter scale
   d. 1½" = 1'0"

3. The elevations are drawn to:

   a. quarter scale.
   b. half scale.
   c. ½" = 1'0"
   d. ¼" = 1'0"

4. What is the length of "G" in the framing plan?

   a. 9' - 2"
   b. 12' - 0"
   c. 12' - 2"
   d. 11' - 8"

5. How many windows does the building have?

   a. 2
   b. 3
   c. 4
   d. none.

6. The concrete footing is:

   a. 8" x 16"
   b. 8" x 8"
   c. 12" x 16"
   d. 8" x 12"

7. The base of the concrete footing is set:

   a. 3' below grade.
   b. 3' - 10" below finish grade.
   c. 3' - 7" below finish grade.
   d. 16" below finish grade.

8. The floor at the garage door is lower than at the rear wall by:

   a. 8"
   b. 1/8"
   c. 2-5/8"
   d. 2-1/8"

9. The concrete floor is:

   a. 8" thick
   b. 6" thick
   c. 4" thick
   d. 2" thick

10. How many courses of concrete blocks are in the foundation?

    a. 2
    b. 3
    c. 5
    d. 8

11. The anchor bolts are spaced:

    a. 10' - 0" O.C.
    b. 18" O.C.
    c. 5/8" O.C.
    d. 6'0" O.C.

12. What is the header over the front door made of?

    a. 2 - 2" x 4"
    b. 2 - 2" x 10"
    c. 2" x 4" jack studs.
    d. 5/4" x 5" jamb.

13. What is the size of the opening on the right side?

    a. 2'8" x 2'6".
    b. 8'0" x 7'0"
    c. 2'6" x 6'6"
    d. There is no opening.

14. How many 18'0" collar beams are needed?

    a. 3
    b. 5
    c. 6
    d. 7

15. What are the correct lengths of the rafters?

a. 7'2" and 13'0"
b. 6'8" and 13'4"
c. 8'4" and 14'6"
d. 7'6" and 13'10"

16. The shortest wall (from the foundation to the top of the plate) is how tall?

a. 6'4 3/4"
b. 5'0"
c. 5'6½"
d. 8'6½"

17. What is the vertical R.O. of the window at the rear?

a. 3'6"
b. 3'10"
c. 2'8"
d. 2'4"

18. What type of roof is used?

a. hip.
b. shed.
c. gambrel.
d. gable.

19. What pitch is the roof?

a. 5" - 12"
b. 6" - 12"
c. 12" - 12"
d. 1" - 6"

20. What is the rafter spacing:

a. 24" O.C.
b. 18" O.C.
c. 16" O.C.
d. 12" O.C.

21. What is the collar beam spacing?

a. 32" O.C.
b. 24" O.C.
c. 18" O.C.
d. 16" O.C.

22. How many anchor bolts are used?

a. 6
b. 16
c. 12
d. 24

23. How long a ridge pole is used?

a. 22'0"
b. 18'0"
c. 11'0"
d. There is no ridge pole.

24. The rafters are supported by:

a. a single plate.
b. a double plate.
c. a triple plate.
d. headers.

25. The wall sheathing is:

a. 4'8" - 5/8" CD
b. 4'8" - 3/4" fiberboard
c. 1" x 8" tongue and groove.
d. 1" x 4" shiplap.

26. The molding around the large door is:

a. 1" x 3" casing.
b. 5/4" x 3" casing.
c. 5/4" x 5" casing.
d. 1/2" x 1-1/2" stop.

27. The symbol S_3 controls:

a. the outlets.
b. the light in the shed area.
c. the light in the garage area.
d. both lights.

28. The shingles are:

a. Redwood.
b. Asbestos.
c. Asphalt.
d. Cedar.

29. The facia is nailed to the:

a. rafter ends.
b. sheathing.
c. collar beams.
d. roof.

30. How many glass lites does the large door have?

a. 4
b. 8
c. 12
d. 16

31. Which view shows the shutters?

a. floor plan.
b. front elevation.
c. left side.
d. rear elevation.

32. What is the area of the garage?

a. 440 ft^2
b. 540 ft^2
c. 330 ft^2
d. 396 ft^2

33. How many pounds will one square (100 ft^2) of shingles weigh?

a. 400 lbs.
b. 180 lbs.
c. 360 lbs.
d. 210 lbs.

34. What size bed molding is used around the facia?

a. 1" x 6"
b. 3/4" x 1-3/4"
c. 1/2" x 1-1/2"
d. None.

35. What size door is shown in the rear elevation?

a. 8'0" x 7'0"
b. 2'4" x 3'6"
c. 3'0" x 6'8"
d. 2'6" x 6'6"

36. From the center of the large door to the right side of the garage is:

a. 12'
b. 18'
c. 8'
d. 10'

37. The sill plate is made of:

a. 2" x 4"
b. 2" x 6"
c. 2" x 10"
d. 2" x 8"

38. The finished floor is how many inches above grade?

a. 1/2"
b. 3"
c. 3-1/2"
d. 4"

39. What kind of siding is used?

a. 10" bevel siding.
b. 1" x 8" T & G.
c. 5/4" x 3" finish.
d. 1" x 6" W.P.

40. How many feet of drip cap is needed?

a. 18' - 6"
d. 17' - 10"
c. 14' - 3"
d. 12' - 6"

41. What length is the perimeter of the foundation?

a. 64'
b. 68'
c. 72'
d. 80'

42. How many horizontal runs of siding is needed on the shortest wall?

a. 6½
b. 8
c. 10
d. 12

43. How many outlets does the plan show?

a. 4
b. 3
c. 2
d. 1

44. Which view would you use to find the number of studs needed?

a. framing plan
b. floor plan
c. elevation views
d. section B

45. What type of window is used in this garage?

a. sliding
b. casement
c. double hung
d. hopper

46. What size corner board is used on the front?

a. 1" x 3"
b. 5/4" x 4"
c. 5/4" x 6"
d. 5/4" x 3"

47. What material is between the siding and sheathing?

a. building paper.
b. facia.
c. molding.
d. nothing.

48. What does the bottom rail of the window rest on?

a. jamb.
b. casing.
c. sill.
d. muntin.

49. What is the distance between the edge of the apron and the left wall?

a. 8"
b. 2' - 2"
c. 2' - 0"
d. 1' - 0"

50. What is the actual exterior length of the garage?

a. 22' - 4"
b. 22' - 1"
c. 22' - 2"
d. 18' - 2"

UNIT TEST: INTRODUCTION TO BUILDING TRADES BLUEPRINT READING

1. C
2. B
3. D
4. B
5. B
6. A
7. C
8. C
9. C
10. C
11. D
12. B
13. D
14. A
15. B
16. C
17. B
18. D
19. B
20. C
21. A
22. B
23. D
24. B
25. C
26. A
27. C
28. C
29. B
30. A
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48. C
49. D
50. C

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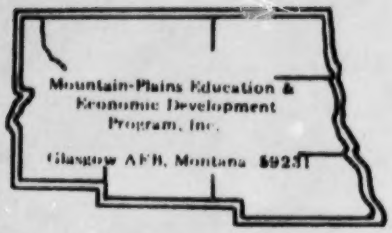

Learning Experience Guide

UNIT: BLUEPRINT READING FOR CARPENTRY

RATIONALE:

Along with wood working skills, a carpenter needs to be able to follow plans for things that he builds. This unit introduces the student of carpentry to methods of obtaining the information needed to build things from blueprints.

PREREQUISITES:

1. Communication Skills at or above Level G.
2. Math Skills at or above Level I.

RESOURCES:

Printed Material

Blueprint Reading and Sketching for Carpenters - Residential. McDonnell and Ball, Delmar Publishers.

Equipment

Scale, architect
Trainagles (30^0 x 60^0 & 45^0)

OBJECTIVE:

Obtain and interpret information from blueprints fro application to carpentry construction.

GENERAL INSTRUCTIONS:

This unit consists of 24 Learning Activity Packages (LAPs). Each LAP will provide specific information for completion of a learning activity.

The general procedure for this unit is as follows:

(1) Read the first assigned Learning Activity Package (LAP).
(2) Begin and complete the first assigned LAP.
(3) Proceed to and complete the next assigned LAP until the unit is completed.
(4) Take the unit tests as described in the Unit LEG "Evaluation Procedures".

Principal Author(s): C. Shramm

PERFORMANCE ACTIVITIES:

.01 Specifications
.02 Dimensions
.03 Scale and the Working Drawings
.04 Elevation Drawings
.05 Wall Sections - Elevations
.06 Interpreting the Elevation Drawings
.07 The Plot Plan
.08 Foundation Drawings
.09 Plan Symbols and Indications
.10 Schedules
.11 Interpreting the Basement Plan
.12 Floor Frame Plan
.13 The Floor Plan
.14 Interpreting the Floor Plan
.15 Roof Frame Plan
.16 Details - General and Cornice
.17 Details - Walls
.18 Details - Windows and Doors
.19 Details - Dormers and Louvers
.20 Details - Stairs
.21 Details - Fireplaces
.22 Details - Cabinets
.23 Interpreting the Detail Drawings
.24 Quanity and Material Lists

EVALUATION PROCEDURE:

When pretesting and post testing:

The student takes the unit multiple-choice pretest.

Successful completion is 4 out of 5 items for each LAP part of the pretest.

FOLLOW-THROUGH:

Go to the first assigned Learning Activity Package (LAP) listed on your Student Progress Record (SPR).

SPECIFICATIONS

Blueprint Reading for Carpentry

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Specifications for Residential Blueprints

SECTION 1 – PREPARATION OF SITE

Article 101 – *Clearing Site*

1. The contractor shall clear the site, removing any trees, stumps, and roots which would interfere with the building operations. All such materials and rubbish shall be removed from the premises.
2. During the building operations all precautions must be taken by the contractor to protect all trees that are to remain. Those near the building shall be protected by wooden guards.

Article 102 – *Laying Out Work*

3. The contractor shall lay out the building accurately upon the site following the marks laid out by the surveyor, and shall be responsible for the erection of all profiles or batter boards, setting same true and level.

SECTION 2 – EXCAVATION

Article 201 – *Basement*

1. The contractor shall do all the required excavation as necessary for basement areas, foundation walls, footings, piers, etc., as shown on the drawings. Excavations shall be carried 2 ft. beyond walls. Excavations shall be carried to depths as shown on drawings. All top soil shall be removed from work area and deposited where directed. All excess earth, not needed for fill, shall be removed from the premises.
2. If rock is encountered, the removal of same will be considered as extra work under this contract. A set price per cubic foot for excavating rock shall be included in the bid for the excavation and used as a basis of payment for such work, in addition to the regular bid for earth removal.
3. The bottoms of all excavations shall be left level and smooth, to proper depths as shown. Should water be encountered during excavation, the contractor shall be responsible for elimination of same, to prevent the holdup of future form or concrete work.
4. All excavation around foundation walls shall be made large enough to allow the placing of a 4" vitrified drainage pipe as shown at footing level. The contractor will lay this pipe with butted joints with a pitch of not less than 1/4" to the foot. The trench for this pipe will be filled with 1" gravel not less than 12" above said pipe. The line of pipe shall be run to some safe distance from the building where the water can be allowed to soak away by means of a dry well.

Article 202 – *Dry Wells*

5. Excavate for and build a dry well for footing drainage. Well shall be six feet by six feet and 5 feet below cellar bottom and twenty feet away from the building. Refill with stone to within 3 feet of grade; cover with creosote-painted plank and tar paper. Dry wells and pipelines for roof drains shall be let under separate contract.

Article 203 – *Back Filling*

6. The contractor shall back fill against all walls and foundations and fill other places necessary to obtain lines as shown on drawings. All earth back filling shall be flushed with water and tamped every layer of 2 feet. After back fill has settled, contractor shall fill in all low spots.

Article 204 – *Finish Grading*

7. By separate contract.

SECTION 3 – MASONRY MATERIALS

Article 301 – *Delivery – Storage*

1. All materials shall be handled and stored so as to prevent damage by water or breakage. All packaged materials shall be kept in original containers until ready for use.

Article 302 – *Water*

2. All water used shall be free from injurious amounts of oil, acid alkali, organic matter, and other deleterious substances.

Article 303 – *Sand*

3. All sand shall be of a good grade of washed bank sand, sharp, well graded and free from salt, clay, and organic matter. It must be properly screened before mixing with cement or mortar. The sand used for plastering shall be best quality, sand-washed and screened, free from alkali salt or quick sand, and must not contain over 5% loam or clay.

Article 304 – *Portland Cement*

4. All Portland cement shall be of an approved brand and must stand the tests required by the A.S.T.M. designation C-150.

Article 305 – *Lime*

5. All lime shall be fresh hydrated lime of a standard product and shall contain not more than 5 percent ashes, clunker, or other foreign matter. All lime used shall comply with the standards of the A. S. T. M. specification C-6-49. All cement and lime shall be kept under cover and be raised from the ground on planks.

Article 306 – *Stone*

6. All crushed stone or gravel used shall be clean, hard crystalline rock, free from shale clay or other soft material. Stone for plain concrete shall be well graded with maximum diameter of not over 2 inches. Crushed stone for reinforced concrete shall not exceed 1 1/2" diameter.

Article 307 – *Mortars*

7. All mortar measurements shall be by volume: sand and cement mixed dry, lime putty added, then enough water added to bring mixture to the proper consistency for use. No mortars shall be used after standing for more than one hour.

   Cement Mortar – 1 part Portland cement, 3 parts sand; lime putty not over 25% of cement volume.

   Cement Lime Mortar – 1 part Portland cement, 1 part lime putty, 6 parts sand.

   Pointing Mortar for stone work – 1 part nonstaining cement, 2 parts white sand to which shall be added enough hydrated lime to make a workable consistency.

   Fire-Brick Mortar – mortar for fire-brick shall be of fire clay.

   Brick Mortar – mortar for all common brick shall be cement, lime, mortar, 1:1:6 mix. Mortar for face brick shall be cement, lime mortar, 1:1:6 mix.

Article 308 – *Hearth Tile*

8. Hearth tile shall be 4" X 4" X 3/4". It shall be hard-burned, but not vitrified and in no case shall it be soft or off-color. Color shall be selected by owner.

Article 309 – *Cinder Block*

9. All cinder block shall meet the standard specifications of A. S. T. M. C-90-44 and Federal Specification SSC-621. These blocks shall be composed of refined Penn. anthracite cinders with a mixture of some local bituminous cinders; the balance of the mixture shall be a sharp clean sand and gravel with an appropriate amount of high early strength cement.

Article 310 – *Brick*

10. All common brick must be of good quality local, hard-burned brick of even color.

Article 311 – *Flue Linings*

11. Flue linings shall be made of fire clay and shall be hard-burned, free from workage, cracks, splits, chips, or other defects.

Article 312 – *Fire Brick*

12. All fire brick shall conform to the standard specification of the A. S. T. M. C-133.

SECTION 4 – CONCRETE WORK

Article 401 – *Proportions of Ingredients*

1. Concrete for all footings shall be 1 part Portland cement, 2 parts sand, four parts broken stone not larger than 2 inch diameter. Concrete for all walls: 1 part Portland cement, 2 parts sand, five parts broken stone. Storage – garage and furnace room: two layers with lower layer 1:2:4 mix; top or finish layer, 1:2 mix. The floors in the

workshop, basement, lavatory, and recreation room: top layer, 1:2; lower layer, 1:2:4 mix. All exterior slabs, floors, and aprons: 1:2:4 mix.

Article 402 – *Mixing Concrete*

2. All concrete shall be mixed by machine. Concrete shall be mixed until there is uniform distribution of all ingredients. The resulting concrete shall be of uniform color and appearance. The maximum time allowed between mixing and placing shall not exceed 30 minutes and no re-tempering will be allowed. All concrete shall be properly tamped, spading the stone away from all form work.

Article 403 – *Forms*

3. All necessary forms shall be provided, erected and braced by the contractor. All forms shall be of sound lumber, properly matched and wired and otherwise supported to insure tightness and rigidity. All loose blocks of wood to be removed from forms before pouring concrete. Froms shall not be disturbed until concrete has set sufficiently to carry its own weight and all other loads that may occur on the concrete.
4. If conditions are favorable, trench forms can be used instead of wood forms; however, sides must be clean, even and vertical and bottoms must be true and level and free from fill.
5. Box out all openings for chases and slots used for wires, pipes, conduit, etc., and build into concrete all inserts, anchors, ties, and hangers as required.

Article 404 – *Curing*

6. All concrete in floors and slabs shall be kept damp continuously for one week after it has been poured.

Article 405 – *Surface Finish*

7. After removing forms, cut back all metal ties, wet and fill all voids and rough surfaces with cement mortar, 1:2 mix. Apply one coat of cement mortar, 1:3 mix, floated and trowelled using wood float.

Article 406 – *Tile Base*

8. The concrete base for tile floor in bathroom shall be composed of one part Portland cement, 2 parts sharp clean sand and 4 parts crushed stone. The crushed stone shall be well graded within the limits of 1/4" to 1/2". This base shall be 1" thick with metal lath imbedded. Lath shall be metal reinforcement lath with triangular mesh of No. 8 wire on 4" centers, diagonally laced with No. 14 wire on 4" centers. Wood floor shall be completely covered with 15-pound pitch felt before covered with metal lath. The metal lath shall be fitted to entire floor area of bathroom, butted to side walls and lapped 2 inches at splices. Lath shall be fastened to wood floor with galvanized staples at 6 inch centers both ways.

Article 407 – *Gravel Fill*

9. Under all concrete floors and slabs, place bed of 1" diameter gravel; this gravel to be wetted and well tamped to the thickness as shown. No gravel bed to be less than 4" thick.

Article 408 – *Rubble Veneer*

10. All rubble walls as shown shall be Ohio-Brierhill natural sandstone in yellow and buff. All stones shall be well bonded, bedded and set down hard. Stones shall be accurately cut to fit where necessary and exposed flame shall be at right angles to the face where possible. Stone retaining walls shall be capped, using 5" stones, laid flat with 1" projection over wall. Joints shall be 1/2". Veneer Stones shall be as close to 5" thick as possible. Maximum height of stones, 12"; maximum length, 20"; minimum height, 4"; minimum length, 8". All stones shall be cleaned and drenched before laying. All stone work shall at all times be adequately protected from damage. On veneer work, galvanized metal ties shall be used. These ties shall be spaced horizontally not over 2 ft. apart, and vertically not over 18". The contractor shall cover all wood surface walls with 15-pound pitch-saturated felt before stone veneer is applied. Felt shall be lapped at least 2 inches and secured to wood sheathing with 1/4 by 1/2 inch wood strips and galvanized nails. The face of all stone work shall be cleaned upon completion with an approved cleaning compound; no acid to be used on stone work.

SECTION 5 – BRICKWORK

Article 501 – *Chimneys*

1. The contractor shall build fireplaces and chimney to dimensions as shown with particular reference to 1/2" scale details. All flues throughout shall be lined with hard-burned terra cotta flue lining set in full mortar joints left smooth on inside with no projections or droppings. Furnace flue shall start not over 4-6" above cellar floor, size as shown. Withes shall be well filled and solid. All brick work shall be kept as least 1 1/2" from all floor framing and 3/4" from all studding. An approved type of terra cotta thimble of proper size shall be placed at proper location for furnace pipe. Furnish and install "Cover" ash trap in first floor fireplace. Each fireplace shall be provided with a "Donley" 242 fireplace damper of the proper size. The fireplace in the recreation room shall be faced with Belden Yorkshire Blend face brick, white mortar, flush joint. Hearth for this fireplace shall be 4" X 4" red tile, 1/2" joint, white mortar.
2. The living room fireplace shall be faced with HY–TEX Brick, Washington Colonials with racked out joints, using black mortar. The tile used for this fireplace hearth will be 4" X 4", heathen brown quarry tile, 1/2" joint, using black mortar. The brick work on the chimney will be carried up to a point one foot below the roof. From this point to a height above the roof as shown on plans, the chimney will be topped with rubble all laid as per stone veneer specification. Cap chimney with cement mortar, 1:2 mix, carrying same to within 1" of top of flues. The contractor will build in at proper joints, 24 oz. copper flashing setting same a minimum of 1 1/2" into joint.

SECTION 6 – STONE FLAGGING

Article 601 – *Concrete Slab*

1. Flagging shall be laid on a well tamped porous fill at least 4 inches thick and a concrete slab 4 inches thick: concrete shall be 1:2:4 mix reinforced with 6 by 6 inch - #10 and #10 wire fabric. Slab shall have proper grade and pitch as shown on the drawings.

Article 602 – *Flagging*

2. When same has set, place 1" setting bed as required to bring flagging to true even finish with proper pitch as required. Flagging will be of 1" to 1 1/4" thick cut on site as required. Type of stone and colors will match stone walls and will be suitable to architect. Pointing mortar shall be 1:2 mix, non-staining. Pattern of flagging shall be semi-irregular, fitted, with all joints finished flush. All work shall be cleaned immediately after pointing, using fiber brushes and muriatic acid if necessary. Acid shall be thoroughly rinsed off with water.

SECTION 7 – DAMPPROOFING

Article 701 – *Dampproofing Walls*

1. The contractor shall furnish all labor and materials to complete all dampproofing as shown on the drawings or herein specified. The outside faces of all concrete walls below grade shall be given one coat of asphalt dampproofing. The dampproofing shall be brush applied. The material to be used is manufactured by Hydro Inc. for the purpose intended and is known as Hydro Tite #21.

2. The contractor shall examine all surfaces to be dampproofed and shall notify the architect in writing of any defects in same. Starting the work by the contractor shall imply his acceptance of the condition as satisfactory.

3. Before applying the materials the contractor shall clean off all surfaces, leaving same clean and ready for dampproofing.

4. Material shall be applied as per manufacturers' directions. The number of coats specified is minimum and if all surfaces are not covered thereby, the contractor shall apply more material. Dampproofing shall not be applied in cold or wet weather or when the surfaces are damp. All concrete floors that are to be covered with asphalt tile shall be given a primer coat of Armstong primer made by Armstong Linoleum Company and applied as per manufacturers' directions.

5. All walls in the workshop, recreation room and basement lavatory shall be given one coat of Hydro Tite #21.

6. The walls of the furnace room and storage room shall be left unfinished.

SECTION 8 – MISCELLANEOUS METAL WORK

Article 801 – *General*

1. The contractor shall furnish all labor and material to complete all structural steel as shown on drawings or herein specified. All steel shall conform to the standard specifications of A. S. T. M. in the latest edition.
2. All steel lintels and girders as shown shall be set true and level. Girder shall have two bearing plates 3/8" thick, 6" square. The contractor shall also place steel curb as shown and shall furnish and install steel hand rail as shown on rear porch.

Article 802 – *Metal Lath*

3. Metal lath shall be Berloy, Milcor or equal, expanded type with protective coating of rust resisting paint. Sheets shall be secured by nails at intervals not exceeding 6" along supports to be placed according to the following schedule; all ceilings main floor, walls in bathroom.

Article 803 – *Corner Beads*

4. Corner beads shall be approved metal corner bead with 1/4" bull-nose and bent and perforated flanges. All beads shall be set true, plumb and straight and securely fastened.

Article 804 – *Roof Flashing*

5. All flashing shall be of 16 oz. cold rolled copper. This shall include base flashing where roof abuts vertical surfaces; step flashing at pitched roof surface and vertical surfaces; valley flashing; flashing at pipes through roof; flashing at louvers and cupolas, gutters and leaders, all as shown on the drawings.
6. All workmanship shall be of the best trade practice.

SECTION 9 – PLASTERING

Article 901 – *General*

1. Cement, lime, sand, mortar and water shall be as specified in Section 3 of this specification.
2. Cement Plaster shall consist of one part Portland cement, two parts lime putty and nine parts sand by volume.
3. Gypsum Plaster Scratch Mortar shall be composed of one part neat gypsum plaster to not exceeding two parts sand by weight where used on metal lath, or one part neat gypsum plaster to three parts sand by weight where used on masonry. If the plaster is unfibred, one bushel of fibre shall be added to each cubic yard of sand used.
4. Gypsum Plaster Brown Mortar shall be composed of one part neat gypsum plaster to not exceeding three parts sand by weight. If the plaster is unfibred, one-half bushel of fibre shall be added to each cubic yard of sand used unless the mortar is being used as a finish coat.

5. Lime Plaster Scratch Mortar shall be composed on one part lime putty, 1/5 part Portland cement and two parts sand, by volume, where used on metal lath, or one part lime putty, 1/10 part Portland cement and three parts sand by volume where used on masonry to which shall be added 7 1/2 pounds of fibre per cu. yd. of sand.
6. Lime Plaster Brown Mortar shall be composed of one part lime putty, 1/10 part Portland cement and three parts sand, by volume, to which shall be added 3 1/2 pounds of fibre per cu. yd. of sand.
7. Hard White Finish shall be composed of pressure hydrated finishing lime putty gauged with calcined gypsum or Plaster of Paris, and a small quantity of white sand or marble dust. The gauging material shall be in sufficient quantity to secure the proper working and setting qualities and produce the finish specified. The sand or marble dust may be omitted where a textured finish is required.
8. Sand Finish Coat shall be composed of 1 part lime putty, 1 1/4 parts sand and 1/10 part Keene cement by volume.

Article 902 – *Plaster Base*

9. The walls of all main floor rooms except as herein specified shall be covered with Gold Bond gypsum rock lath nailed on edges every four inches. Use coated nails; stagger and break joints.

Article 903 – *Plastering Coats*

10. All plaster used in the work shall be of the best quality of the following brands: Magra, Peerless, or U.S. Gypsum. Finishing coat to be U.S. Gypsum Ivory or Tiger Brand White Rock. All plastering on rock lath shall be done in brown and finishing coat; on metal laths all plastering shall be three coats; brown, scratch and finish coats. The finish coat shall be troweled and left smooth, hard and free from all marks; corners, angles and intersections shall be carefully formed and in perfect line. All ceilings on main floor except kitchen and bathroom shall be carpet floated, sand finish. Keene cement shall be used on bathroom walls.

Article 904 – *Patching*

11. After all trades on the building including the plumbing, heating and electrical trades have completed their work the plasterer must patch and make good all broken and defective plaster, leaving all plaster free from cracks, stains and other defects.

SECTION 10 – TILE WORK

Article 1001 – *Preparatory Work*

1. The installation of concrete slabs, concrete fills, metal lath on bathroom floor and walls and similar supports for tile work are specified in other sections of these specifications.

2. The contractor shall furnish all labor and materials to complete ceramic tile, marble and quarry tile work as shown. All tile including setting beds shall include the following: fireplace hearths, bathroom floor, and bathroom walls. A marble threshold shall be furnished and set in bathroom. Floor tile shall be ceramic 2" X 2"; color and pattern shall be chosen by owner. Wall tile shall be glazed 4" X 4". In tub stall, wall tile will be carried to a height of six feet with molded cap. Other bathroom wainscoting shall be four feet high, with base plinth blocks and molded cap. The contractor will furnish and set one towel bar, one soap holder, one tissue insert, and one assist bar, all of approved shape and color. All work under this division shall be thoroughly cleaned at completion and protected from damage.

SECTION 11 – CARPENTRY

Article 1101 – *Framing Materials*

1. All framing material herein referred to shall conform to American Lumber Standards as specified in Simplified Practice Recommendation R16-29 Lumber (4th edition) issued by the Bureau of Standards of the U.S. Department of Commerce, Washington, D.C. It shall be dressed on four sides to standard dimensions and shall be free from defects or imperfection that might impair its durability or strength. The contractor must furnish and assemble any timber of the proper size and kind necessary to the completion of the building whether specifically mentioned or not. All work shall be framed in a thorough and workmanlike manner. All sills, if solid, shall be halved and lapped at all corners. Trim all wells and openings and in no case shall headers and trimmers be less than two inches from a chimney. All headers, trimmers, and studs around openings must be durable. All framing lumber shall be equal to No. 1 common grade.

Article 1102 – *Sizes*

2. The general sizes of rough lumber shall be as follows:
   Sills 2" X 4", 4" X 6" FIR
   Girders 6" X 8", 8" X 10" FIR
   Studding 2" X 4" FIR
   Joists 2" X 8", 2" X 10" FIR
3. Common Rafters, 2" X 6"; Hip-Valley Rafters 2" X 8" FIR
   Plates 2" X 4", Doubled 2" X 6" FIR
   Bridging 2" X 3" FIR
   Furring 1" X 2" SPRUCE
   Sheathing 1" X 6" N.C. PINE
   Firestops 2" X 3", 2" X 10" FIR

Article 1103 – *Cutting*

4. The contractor shall do all cutting of woodwork to accomodate the work of the other trades but no cutting shall be done that will impair or weaken the structure.

Article 1104 – *Sills*

5. Sills shall be set level and true and shall set of a bed of cement, 1:3 mix. Sills shall be anchored with 5/8" X 18" anchor bolts, spaced not over 6' on centers. Anchors shall also be set 18" from each corner.

Article 1105 – *Girders*

6. Girders shall be set true and straight with 1/2" crown on 20'. All girders shall be flush type with 2" X 3" cleat, securely spiked.

Article 1106 – *Plates*

7. Wall and bearing partition plates shall be double; nonbearing partition plates, single. The cap plates on cinder block walls in basement shall be 4" X 6" single, anchored to wall with 1/2" X 12" bolts, spaced not over 4' o.c.

Article 1107 – *Joists*

8. Joists resting on wood sills shall rest directly on same. Joists resting on or against steel I beams or flush type girts or girders shall be notched to proper depth.
9. Joists shall be set with crowning side up. Double all joists, parallel to and under partitions. Such doubled joists shall be separated with 2" blocking. Space joists under bathroom floor 12" o.c.

Article 1108 – *Joist Cross Bridging*

10. Cross bridging shall be made of 2" X 3" strips with ends beveled and double crossed. Spacing shall be according to local building code, or, 1 row on spans up to 10', 2 rows on spans 10' to 18'. Nail each end of bridging with two 8d common nails. Bottom ends shall be nailed after subfloor is in place.

Article 1109 – *Studs*

11. Arrange three studs to provide lath nailing at all corners. Double all studs at sides of openings, inside stud to support header. All studs shall be spaced 16" o.c. unless noted otherwise and unless other spacing is required for ducts and pipes. Frame all stud openings to proper size to secure door and window frames and jambs.

Article 1110 – *Stair Carriages*

12. Basement stair stringers shall be supported with vertical 2" X 4" studs extending to basement floor at mid-distant of the stringer length. Attic stair stringers shall be supported with nails into partition studs, mid-distant of the stringer length.

Article 1111 – *Rafters*

13. Rafters shall be spiked to plate and cut accurately to detail to secure a solid bearing. In unfinished attic where no ceiling beams occur provide collar beams at three feet above attic floor, 1" X 6", well nailed at every second rafter. Cut all rafters to form all pitches as shown.

Article 1112 – *Firestopping*

14. Firestops shall be at least 2" thick and shall be arranged so as to cut off all concealed draft openings and form an effectual draft barrier between stories and roof spaces.

Article 1113 – *Grounds*

15. The contractor shall furnish and set 3/4" X 7/8" cedar or redwood grounds around all door openings. The base grounds shall be 3/4" X 4" N. C. Pine, set down on subfloor. Door grounds shall be gauged for parallel width to jamb size. All grounds shall be set straight and true.

Article 1114 – *Roof Sheathing*

16. Sheathing shall be tightly laid and nailed twice at every bearing. Joints shall be broken at least every 32". All end joints shall be made on a bearing.

Article 1115 – *Wall Sheathing*

17. Sheathing shall be applied horizontally with tight joints and nailed twice at every bearing. ing. All end joints shall be made over a bearing.

Article 1116 – *Subfloor*

18. Subfloor shall be laid diagonally and nailed twice at every bearing, except as herein noted. Under ceramic tile in bathroom the subfloor shall be supported by 1" X 3" cleats nailed to sides of joists. The subfloor material, 5/8" fir waterproof plywood, shall be set 3" below the tile floor. The subfloor under asphalt tile shall be of 5/8" fir plywood. All edges of this plywood shall bear on joists or headers, and all edges shall be nailed every six inches with large head 6d common nails.

Article 1117 – *Building Paper*

19. All exterior wall sheathing shall be covered with water proof kraft paper weighing not less than 9 oz. per square yard, Flintkote or equal lapped 2" and nailed with large head galvanized nails. All roof sheathing shall be covered immediately after laying with 35# glossy asphalt building paper, lapped 3", Carey or Johns–Manville.
20. All exterior walls and ceiling shall be insulated with 2" blanket type insulation placed in strict accord with the manufacturer's directions, Red Top glass fiber, or equal.

Article 1119 – *Shingling*

21. All shingles to be asphalt, strip type, 200# Flintkote or equal laid as per manufacturer's directions, using large head galvanized nails. Shingles shall be cut accurately at valleys, intersections, ridges, and hips. Starter course shall consist of 1 row 16" red cedar shingles and 2 rows of asphalt shingles.

Article 1120 – *Furring*

22. The walls and ceilings shall be furred with not less than 1" X 2" spruce and as noted on

the drawings. Furring shall be provided where required to form a solid nailing base and shall be well-nailed and set true and straight, to receive various finishes.

Article 1121 – *Exterior Finished Carpentry*

23. The contractor shall furnish and install all exterior finished carpentry shown on the drawings or specified herein or both as follows: all lumber shall be white pine - C select, unless otherwise specified. All moulding shall be stock patterns, sizes as shown.

Article 1122 – *Cornice*

24. The contractor shall build the cornice according to details, using 2" X 3" lookout blocks at every rafter. Plancier to be 3/8" composition board.

Article 1123 – *Vertical Siding*

25. Siding shall be T X G bevel edge, random widths accurately scribed and fitted. All edges and ends in contact with stone work or copper flashing shall be given one coat of white lead.

Article 1124 – *Clapboards*

26. Clapboards shall be 8" Western Red Cedar, neatly fitted against all corner boards and frames. Clapboard courses to be not in excess of 6 inches of exposure.

Article 1125 – *Cased Post*

27. As shown - Shall be composed of two 2 by 4's spiked together and cased with 3/4" by 6" white pine.

Article 1126 – *Water Table*

28. Install 1 1/8" X 6" water table where needed to form first course for clapboards. No drip cap to be used but top edge of water table shall be beveled 1/8".

Article 1127 – *Trellises*

29. The contractor shall furnish and install all trellis work as shown according to details. Fasten all trellis work firmly to concrete and stone work with 20d spikes driven into lead sleeves.

Article 1128 – *Cupola*

30. The cupola shall be completely assembled at the mill as per details with roof and walls of 3/4" waterproof fir plywood, exterior grade. The entire cupola shall be given a primary coat of white lead and oil before being placed in position. Install metal louvers. The cupola shall be accurately fitted to roof and neatly flashed with 16 oz. copper. Cupola roof shall be 16 oz. copper.

Article 1129 – *Louvers*

31. The contractor shall furnish and install louvers as per details. Louvers to be mill assembled and given a coat of white lead paste before installation. The louvers shall be accurately fitted to all roof planes and shall be flashed with 16 oz. copper to make a watertight job. The copper roof on the round top louver shall be let under a separate contract.

Article 1130 – *Windows – Wood*

32. All double-hung frames and sash shall be Anderson or Morgan, clear white pine, except pulley stiles and parting beads which will be of yellow pine. Sash to be 1 3/8" thick and fitted with tubular type spring balancers. All sash sizes as per window schedule. All wood casement frames and sash to be "Curtis Insulated Silentite" with stock for type of window specified.

33. All basement window frames and sash shall be Anderson or Morgan pine with movable sash.

Article 1131 – *Exterior Door Frames*

34. Door frames, except garage, shall be Curtis or Morgan of white pine, rabbeted for 1 3/4" doors. Door jamb reveal shall not be less than 1 1/8". Door sills shall be of oak. Garage door frames shall have 3/4" W. P. jambs, installed as per directions given by manufacturer of overhead doors.

Article 1132 – *Ceiling Boards*

35. The ceiling boards over porch and front entrance shall be of 1" X 6" T. & G. white pine.

36. All exterior finished carpentry shall be erected plumb, level, true and in accord with all details. All members shall be erected in as long pieces as is practical with joints arranged to be as inconspicuous as possible. All work shall be well nailed with all nails countersunk. All work to be left free from defects and in good condition to receive the finish.

Article 1133 – *Interior Finished Carpentry*

37. The contractor shall furnish and install complete, all interior finished carpentry work, as shown on the drawings or herein specified, or both. All woodwork, trim, cabinets, etc. shall be of clear Idaho white pine, "B" grade, unless otherwise specified. Lumber shall be protected from damage, both in transit and at the job site. Material shall not be delivered unduly long before being needed for the proper conduct of the work. Lumber shall not be stored or installed in the building until ten days after the completion of plastering.

Article 1134 – *Jambs*

38. Jambs shall be full width of partitions, with all edges back beveled, and sides rabbeted to receive heads. Set minimum of five shim blocks per side. Blocks shall be placed behind

door hinge locations.

Article 1135 – *Casings*

39. All door and window casings shall be 2 1/2" face, pattern to be suitable to owner. Trim shall be assembled at the mill with corners mitered and splined. Casings shall be erected plumb, square and true with 1/4" reveal on door frames.

Article 1136 – *Doors*

40. All door sizes shall follow door schedule: all exterior doors, 1 3/4" thick; all interior doors, 1 3/8" thick except as herein noted. All exterior doors shall be #1 pine "Curtis" or Morgan of patterns approved by the architect.

Article 1137 – *Doors – Interior*

41. All interior flush doors shall be of an approved manufacture, hollow core, of white pine cross banded with 1/8" veneers and faced vertically on both sides with 1/20" thick veneers of white pine. Sliding doors shall be seven ply white pine plywood, complete with hangers, guides and track of an approved type. Batten doors shall be five ply white pine plywood, backed with three 6" horizontal battens.

Article 1138 – *Doors – Garage*

42. Garage doors shall be of overhead type, roll up, four section, of approved manufacture, properly fitted and hung and controlled by overhead mechanism of approved type. All garage door hardware shall be fitted and placed as per manufacturer's directions.

Article 1139 – *Base*

43. Install 1" X 4" base, mitering all external and coping internal corners. Shoe mould, 1/2" ogee pattern; base mould, C 5451. The base mould shall be continous around radiation openings. Base in closets 1" X 4" with no base moulding.

Article 1140 – *Mantels*

44. Furnish and install special mantel on Living Room fireplace as per detail, tapered surround of white pine.

Article 1141 – *Ironing Board*

45. Furnish and install one R 9204 or similar built-in ironing board with flush plywood doors.

Article 1142 – *Closets*

46. All closets will be furnished with 1" X 12" shelves, maximum amount of 1" X 3" hook strip and one closet pole of fir, 1 1/2" diameter. All linen closets shall be fitted with shelving of maximum widths spaced not over 12".

Article 1143 – *Medicine Cabinet*

47. The medicine cabinet shall be of steel, made by Baxter Manufacturing Company – #GR 901.

Article 1144 – *Kitchen Cabinets*

48. Kitchen cabinets and cupboards shall be mill assembled, sizes and lengths as per details. All rails and stiles 2". All exposed ends of 1/2" plywood. Doors and drawer fronts of 3/4" plywood, lipped 3/8". Drawer sides and backs, 1/2" white wood; drawer bottoms, 1/4" fir plywood. Provide all lower cabinets with 3" X 3" toe space. Counters shall be 3/4" waterproof fir plywood, 36" high, covered with Formica or equal as approved. All cabinet doors to be fitted with magnetic catches. Prefabricated Morgan cabinets or equal may be used in place of above.

Article 1145 – *Paneling*

49. The walls of the lavatory and workshop shall be covered with 3/8" fir plywood. Place 1" X 3" chair rail, four feet above floor in lavatory and cover all plywood joints with 1/4" X 1" plain white pine panel strips. Run 3" crown mould at ceiling. All vertical plywood joints to be accurately fitted. Ceiling moulding, 3" cove.

50. The paneling in the recreation room and hall leading to lavatory shall be knotty pine random widths, in continual lengths from floor to ceiling. Knotty pine shall be tongue and grooved, matched with v joints, and shall be blind-nailed.

Article 1146 – *Stairs*

51. The contractor shall furnish all labor and materials to complete all wood stair work as shown on the drawings and herein specified, or both. All material shall be stock of an approved quality. All stair work shall be cabinet work finished and installed by skilled mechanics. Cellar stair treads of oak with W. P. risers and skirt boards. Attic stair treads of oak with W. P. risers and skirt boards. All treads and risers shall be tongued and grooved and skirt boards or stringers shall be housed. All work to be wedged and glued. Both stairs shall have one 1 3/4" round stair rail each complete with two rosettes and three rail brackets. All work to be hand sanded and left ready for painter.

Article 1147 – *Finish Floors*

52. The contractor shall furnish and lay wood finish floors in the living room, bedrooms, dining area and connecting halls. All flooring shall be #1 clear white oak, 2 1/4" face. All flooring shall be kiln dried and shall not be brought to the job until plaster is dry. Under all finish floor place a layer of 15# asphalt-saturated wool roll felt and lap all joints 2". All wood floors to be machine-sanded with all edges hand-scraped and hand-sanded, and left in good condition for finishing.

SECTION 12 – PAINTING AND FINISHING

Article 1201 – *Delivery and Storage*

1. Delivery – Painting, varnishing, and finishing materials shall be delivered to the site in unopened, original containers, bearing manufacturers' printed labels.
2. Varnish – All varnish shall be delivered to the job in the manufacturers' original containers, bearing labels denoting the quality, brand and trade name. Containers of over five gallons capacity shall not be used. Said containers shall be bulked in convenient size cartons for delivery. The cartons shall be effectively sealed by the manufacturer of the varnish and the seal shall be unbroken when the varnish is delivered to the job.
3. Storage – The materials shall be stored at the site where directed. The storage space shall be stored at the site where directed. The storage space shall be kept clean. Oily rags shall be burned or removed from the premises at the close of each day's work and all other necessary precautions taken to avoid damage by fire.

Article 1202 – *Materials*

4. Standard brands of the highest quality shall be selected by the owner with the approval and guidance of the architect.
5. An approved Painting and Finishing Schedule shall be set forth on the drawings to assist the contractor to estimate costs. This schedule shall show types of finishes on all surfaces to be painted, room and space identification.

Article 1203 – *Preparation of Surfaces*

6. Bare metal shall be thoroughly cleaned of all foreign matter, rust and dirt, before paint is applied.
7. Shop painted metal shall be cleaned and the shop coat retouched where marred, before succeeding coats are applied. Oil or grease shall be removed with a suitable solvent.
8. All painting on hollow metal shall be thoroughly sandpapered and any dents or imperfections shall be filled with knifed or metallic filler.
9. Woodwork to be painted or varnished shall be in perfect condition before being coated. The surface shall be clean, smooth and dry.
10. Before acid stain is applied to open grain hardwood, the surfaces shall be lightly sponged with cold water. After the wood has dried, the raised grain shall be removed and the surface smoothly sandpapered. The stain shall be freely applied with a soft-hair brush, repeating the brushing, or wiping so as to remove any blotching and uneven surfaces, producing a uniform color.
11. All scratches, dirt, stains, raised grain, or other surface defects, shall be removed before the painting or varnishing is started.

12. Painting or varnishing shall not be done under conditions of weather or temperature unsuitable for executing a first-class job. The atmosphere must be free from dust and dirt, preventing the lodgment of foreign matter in the fresh paint or varnish. Floors must be broom clean before painting is started.
13. Woodwork to be painted shall have all knots, pitch streaks and bad sap spots shellacked two coats before priming coat is applied.
14. When surfaces to be painted or varnished are defective or unsuitable for coating, the contractor shall prepare such surfaces as directed by the architect.
15. Plaster – Scratches, cracks, holes and other defects in plaster surfaces shall be filled with a composition of 50% whiting and 50% plaster of Paris by volume, sifted into glue size water. The filling composition shall be leveled off flush with the adjoining surfaces and when dry shall be sandpapered smooth. Patches in cement plaster shall be stippled to match the texture of the cement plaster.
16. Plaster surfaces which have never been painted shall be uniformly coated with a solution composed of 2 pounds of zinc sulphate to 1 gallon of water, to which shall be added 1 ounce of dry sienna to each gallon of zinc sulphate solution. Twenty-four hours after application of zinc sulphate solution, the surfaces shall be thoroughly washed with clear water.

Article 1204 – *Workmanship*

17. Painting – Priming coats on woodwork, except for woodwork where priming is required at the shop, shall be applied as soon as possible after the work is in place. All coats of paint shall be laid on so as not to show brush marks. The top and bottom edges of all wood doors which extend down to the floor shall be given two coats of paint. All other edges of doors shall be finished the same as face of doors. The top and bottom edges of all wood sash shall be given 2 coats except that top of meeting rails shall be finished the same as interior face of sash. Shop coat on metal shall be applied by brush or spray.
18. No paint shall be applied on sliding contacts or similar surfaces where bare metal is necessary for the proper operation of the unit and any paint applied to such surfaces shall be removed as a part of the work under this section of the specifications.
19. Undercoats on interior wood or metal finishes shall be thoroughly sanded with Number 00 Sandpaper, or other equal abrasive, removing all surface defects and providing a smooth, even surface for subsequent coats.
20. Varnish and Enamel shall be evenly and smoothly flowed on, and shall show no sags or runs.
21. Varnish shall be used as it comes from the manufacturer's container, without thinning or adulterating. The varnish shall be flowed on, and all coats except the last shall be sandpapered.
22. Staining – Surfaces specified to be stained shall be covered with a uniform application of stain, equalized where necessary and wiped off if required.
23. Shellac shall be evenly applied producing a uniform coating.

24. Putty Stopping – Nail holes, imperfections and defacement in both exterior and interior wood finishes shall be putty stopped after priming coat of paint, filler or shellac has been applied. Putty stopping shall be brought flush with the finished surface in a neat and workmanlike manner.
25. Protection – Work subject to damage or defacement shall be properly protected. Floors, stair treads, landings and the like shall be covered with heavy building paper or cloth properly secured in place. At acceptance, the paint and varnish finish work must be in a neat, sound, undamaged condition.
26. Cleaning – Upon completion of the paint and varnish work, all surplus materials, empty packages, debris and the like shall be removed from the building and premises. All finished work shall be retouched where necessary, thoroughly cleaned and left in a neat, perfect condition. Daubs or spatterings of paint or varnish, shall be removed from hardware, glass, floors, walls or any other surface thus disfigured.

SECTION 13 – ROUGH HARDWARE

Article 1301 – *Rough Hardware*

1. The Contractor shall furnish all nails, spikes, bolts, screws, hangers, stirrups, anchors, ties and other accessories shown on the drawings or as required to secure the woodwork properly and all such accessories shall be of design required to develop the full strength of the members to which they are attached. Anchors or other accessories required to be built in with the masonry shall be furnished in ample time and the setting of same given all necessary attention to insure their proper location.
2. Copper Nails shall be used for all exterior nailing on cupolas, louvers, and trellises unless the woodwork is completely covered with copper.

SECTION 14 – FINISH HARDWARE

Article 1401 – *Materials*

1. The owner shall select the type, color, and material of all finish hardware with the guidance of the architect who, in turn, shall set up a hardware schedule showing the locations of installation and keying of door locks and all other required hardware. Schedule of hardware shall be printed on the drawings for the convenience of the contractor in estimating and clear understanding of locations.
2. Contractor shall install all finish hardware.

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PRE/POST TEST ANSWER KEY

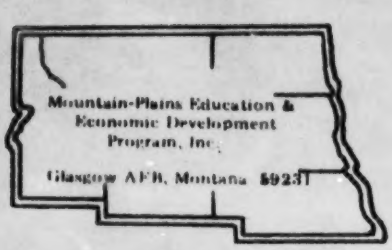
Occupational Area: BLUEPRINT READING FOR CARPENTRY
File Code: 79.02.03.00 A2-2
Name: _____
Family Pay Number: _____ Sex: M F (Circle 1)

ANSWERS

1. D	21. D	41. C
2. C	22. D	42. D
3. B	23. C	43. A
4. C	24. A	44. B
5. A	25. B	45. A
6. D	26. B	46. C
7. C	27. A	47. D
8. B	28. D	48. B
9. C	29. D	49. C
10. B	30. C	50. B
11. A	31. A	51.
12. B	32. C	52.
13. C	33. D	53.
14. A	34. A	54.
15. B	35. B	55.
16. A	36. B	56.
17. B	37. C	57.
18. C	38. A	58.
19. A	39. C	59.
20. C	40. D	60.

File Code: 79.02.04.00.A2-1

Date Published: 1/6/76



Learning Experience Guide

UNIT: BLUEPRINT READING FOR PLUMBING

RATIONALE:

Along with plumbing skills, a plumber needs to be able to follow plans for the installation of plumbing. This unit introduces the student of plumbing to methods of obtaining the information needed to install plumbing from blueprints.

PREREQUISITES:

1. Communication Skills at or above Level G.

2. Math Skills at or above Level 1.

RESOURCES:

Printed Materials

Blueprint Reading for Plumbers Residential and Commercial. Delmar Publishers.

Equipment

Scale, architect
Scale, engineer
Triangles (30^0 x 60^0 & 45^0)

OBJECTIVE:

Obtain and interpret information from blueprints for application to plumbing installation.

GENERAL INSTRUCTIONS:

This unit consists of 39 Learning Activity Packages. Each LAP will provide specific information for completion of a learning activity.

The general procedure for this unit is as follows:

(1) Read the first assigned Learning Activity Package (LAP).
(2) Begin and complete the first assigned LAP.

Principal Author(s):

C. Schramm

General Instructions: Continued

(3) Proceed to and complete the next assigned LAP until the unit is completed.
(4) Take the unit tests as described in the unit LEG "Evaluation Procedures".

PERFORMANCE ACTIVITIES:

.01 Introduction to Piping Drawings
.02 Reading the Architect's Scale
.03 Laundry Tray and Floor Drain in Basement Plan
.04 Kitchen Floor Plans
.05 Bathroom Floor Plans
.06 Rough-in for Kitchen Sink
.07 Rough-in for Lavatory
.08 Rough-in for Water Closet Combination
.09 Rough-in for Bathtub with Shower
.10 Fundamentals of Isometric Drawings
.11 Aids to Drawing Isometric Pipe Diagrams
.12 Dimensioning Isometric Drawings
.13 Waste and Vent for Kitchen Sink
.14 Waste and Vent for Two Lavatories
.15 Three Lavatories to a Single Stack
.16 Soil Stack, Waste and Vent Piping for Water Closet and Lavatory.
.17 Three-Fixture Bath on One Wall
.18 Bathroom Fixtures on Opposite Walls
.19 Four-Fixture Bath
.20 Two Bathrooms: Back to Back
.21 Bathroom and Kitchen Fixtures into One Stack
.22 The Wall-Hung Toilet
.23 Men's Toilet Room - Slab on Grade
.24 Visualizing the House
.25 Sewage Disposal System
.26 The House Drain
.27 The Waste Stack and Vent Piping
.28 The Soil Stack and Vent Piping
.29 Hot and Cold Water Piping in the Basement
.30 Water Piping to Kitchen and Laundry and to the Bathrooms
.31 Gas Piping
.32 Plot Plans and the Engineer's Scale
.33 An Overall Picture of the Building
.34 Elevations and the Plumbing Installation
.35 The House Drain
.36 Soil Stack, Waste and Vent Piping
.37 Hot and Cold Water Piping
.38 Gas Piping
.39 Continued Practice in Blueprint Reading

EVALUATION PROCEDURE:

When pretesting and post testing:

The student takes the unit multiple-choice pretest.

Successful completion is 4 out of 5 items for each LAP part of the pretest.

FOLLOW-THROUGH:

Begin working now on the first LAP of this unit.

Student: _____ File Code: 79.02.04.00

Date: _____ Date Published: 1-30-75

Revised: 11-29-78

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

PRE/POST TEST: BLUEPRINT READING FOR PLUMBING

Using the blueprint and specifications for the residential plan, answer the following questions:

1. The size of the lot in square feet is:

   a. 8,000 sq. ft.
   b. 40,000 sq. ft.
   c. 4,000,000 sq. ft.
   d. 800 sq. ft.

2. The source of water for this house is:

   a. artesian well.
   b. city water.
   c. deep well.
   d. no source specified.

3. The system of sewage disposal is:

   a. septic tank and drain field.
   b. septic tank alone.
   c. city sewer line.
   d. ordinary drain field.

4. The plumbing installations required in the basement lavatory are:

   a. shower, lavatory, and water closet.
   b. shower, water closet, and floor drain.
   c. shower, lavatory, and medicine chest.
   d. shower, water closet, and K.

5. The location of the electric water heater is:

   a. in the basement lavatory.
   b. not given on the plans.
   c. in the furnace room.
   d. in the pump room.

6. The appropriate amount of pipe needed to supply cold water to the basement lavatory is:

   a. 135 feet.
   b. 25 feet.
   c. 40 feet.
   d. 100 feet.

7. The wall between the workshop and the lavatory is made of:

   a. 8" cinder blocks
   b. plywood paneling.
   c. concrete.
   d. 2" x 10" studs.

8. The pipe at the bottom of the footing is:

   a. 4" cast iron drain pipe.
   b. 8" cast iron drain pipe.
   c. 4" perforated composition drain pipe.
   d. 4" vetrified drain pipe.

9. The pipe leading to the septic tank is:

   a. 4" T.C.
   b. 12"
   c. 2" C.I.
   d. 8"

10. The inside dimensions of the pump room are:

   a. 3'11 3/4" x 4' 0"
   b. 3' 11" x 4' 0"
   c. 3' 11 3/4" x 3' 4"
   d. 3' 11" x 3' 8"

11. The distance from the finish floor to the top of the kitchen sink is:

   a. 2' - 6"
   b. 4' - 6"
   c. 3' - 0"
   d. 1' - 6"

12. The invert of the house drain is to be how many inches under the house footing?

   a. 20 inches.
   b. 17 inches.
   c. 6 inches.
   d. 7 inches.

13. What size is the sewer line to the septic tank?

   a. 5 inches.
   b. 6 inches.
   c. 4 inches.
   d. 8 inches.

14. What is the grade per foot of the sewer line to the septic tank?

   a. 1/2 inch per foot.
   b. 1/8 inch per foot.
   c. 1/4 inch per foot.
   d. 5/8 inch per foot.

15. What is the minimum capacity of the septic tank in gallons?

    a. 750 gallons.
    b. 300 gallons.
    c. 500 gallons.
    d. 1000 gallons.

16. The overall length of the house across the front is:

    a. 44' - 0"
    b. 53' - 10"
    c. 44' - 7¼"
    d. 64' - 5¼"

17. What material shall the distribution box at the drain field be made of?

    a. cinder block.
    b. 2 x 4 lumber.
    c. plywood.
    d. pre-cast concrete.

18. What size is the water storage tank for the pump?

    a. 60 gallon tank.
    b. 80 gallon tank.
    c. 40 gallon tank.
    d. 100 gallon tank.

19. The number of rooms in the basement requiring plumbing is:

    a. 4
    b. 3
    c. 2
    d. 1

20. What type pump is recommended in the specifications?

    a. 3 phase; 25 GPM jet pump.
    b. 1 phase pulsating pump.
    c. 3 phase shallow well pump.
    d. 3 phase; 25 GPM circulatory pump.

21. What type of hot water tank is required?

    a. 50 gallon fast recovery.
    b. 30 gallon 1500 watt.
    c. 60 gallon gas fired.
    d. 60 gallon 3000 watt electric.

22. The details for location and construction of the dry well is given:

    a. on the elevations.
    b. in the specifications.
    c. on the basement plan.
    d. on the floor plan.

23. What type of heat is used on the plan?

    a. stoker.
    b. hot water.
    c. hot air.
    d. heat pump.

24. The distance from the property line to the street is:

    a. 200' 0"
    b. 18' 0"
    c. 13' 0"
    d. 5' 0"

25. What type of fuel will the heating system use:

    a. oil.
    b. electric.
    c. gas.
    d. cool.

26. What is the size of the fuel tank?

    a. 50 gallons.
    b. 80 gallons.
    c. 350 gallons.
    d. 350 gallons.

27. Where is the fuel tank located?

    a. furnace room.
    b. garage.
    c. storage room.
    d. outside.

28. What is the minimum depth below grade of the invert at the septic tank?

    a. 7"
    b. 1'6"
    c. 101'
    d. 1/8"

29. The overall exterior dimensions of the concrete areaways are:

    a. 15 2-3/4" x 9'6"
    b. 2'4" x 3'0"
    c. 2'4" x 2'4"
    d. 2'4" x 2'0"

30. Thickness of the walls of the pump room is:

    a. 1'3", 8", 5"
    b. 8", 10", 1'6"
    c. 8", 1'6", 1'3"
    d. 3' 11-3/4", 1'6", 10"

31. The size of the wood plates used on top of the cinder block wall is:

    a. 2" x 4"
    b. 4" x 6"
    c. 6" x 8"
    d. 2" x 10"

32. What material is the main run house drain constructed of?

    a. 6" vertrous clay pipe.
    b. 4" vertrous clay pipe.
    c. 4" extra heavy cast iron pipe.
    d. 4" soil pipe.

33. What are the recommended branch pipe sizes code permitting?

    a. 4" service weight cast iron soil pipe.
    b. 3" galvonized pipe.
    c. 3" extra heavy cast iron soil pipe.
    d. 4" extra heavy cast iron soil pipe.

34. What type water pipe is specified?

    a. type K copper pipe.
    b. type L copper pipe.
    c. galvanized pipe.
    d. plastic pipe.

35. The number of rooms on the first floor requiring plumbing is:

    a. 1
    b. 2
    c. 3
    d. 4

36. The number of plumbing fixtures in the upstairs bath is:

    a. 5
    b. 3
    c. 2
    d. 4

37. The number of plumbing fixtures in the basement bathroom is:

    a. 6
    b. 3
    c. 4
    d. 5

38. How many hose bibbs shall be installed?

a. one.
b. two.
c. three.
d. four.

39. Where would you find out where the hose bibbs are located?

a. location marked on blueprint.
b. location given in the specifications.
c. location given on page 2/7.
d. locations given on plot plan.

40. Reading the specifications, who locates the water lines in this house?

a. the plumber.
b. the architect.
c. the housebuilder.
d. the owner.

41. Does the drawing specify a floor covering in the basement lavatory?

a. yes, industrial carpeting.
b. no.
c. yes, linoleum.
d. yes, asphalt tile.

42. Of what material are the basement partitions?

a. 2" x 8" studs.
b. plywood.
c. concrete.
d. cinder block.

43. What are the approximate internal dimensions of the first floor bath area?

a. 10' 9" x 12' 11"
b. 8' 0" x 10' 9"
c. 7' 6" x 10' 0"
d. 5' 9" x 10' 9"

44. How many down spouts are shown from the rain gutters?

a. 8
b. 4
c. 6
d. 7

45. What is the sewer length from the house to the septic tank?

a. 23'
b. 28'
c. 20'
d. 35'

46. Approximately how many feet of tile are needed for the seepage bed?

    a. about 125 feet.
    b. about 1000 feet.
    c. about 110 feet.
    d. about 90 feet.

47. What is the elevation of the invert of the sewer at the footing of the house:

    a. 90' 0"
    b. 93' 1/2"
    c. 92' 6"
    d. 92' 3/4"

48. What is the length of outflow line from the septic tank to the distribution box?

    a. about 45'
    b. about 40'
    c. about 50'
    d. about 35'

49. How much drop will the sewer have from the house to the septic tank?

    a. 5"
    b. 3-1/2"
    c. 1-1/4"
    d. 6-3/4"

50. What is the elevation of the finished basement floor:

    a. 94' - 5"
    b. 93' - 1"
    c. 102' - 8"
    d. 101' - 0"

UNIT TEST ANSWER SHEET
PRE/POST TEST ANSWER KEY

Occupational Area: 79.02.04.00
File Code: _____
Name: _____
Family Pay Number: _____ Sex: M F (Circle 1)

ANSWERS

1. B	21. D	41. D
2. A	22. B	42. D
3. A	23. B	43. C
4. A	24. B	44. A
5. C	25. A	45. B
6. C	26. D	46. C
7. A	27. A	47. C
8. C	28. B	48. B
9. A	29. B	49. B
10. C	30. B	50. A
11. C	31. B	51.
12. D	32. C	52.
13. C	33. C	53.
14. B	34. B	54.
15. D	35. B	55.
16. B	36. D	56.
17. D	37. B	57.
18. B	38. C	58.
19. B	39. B	59.
20. A	40. A	60.

Student: _____ File Code: _____

Date: _____ Date Published: 12-04-78

Family Education Program

SPECIFICATIONS FOR RESIDENTIAL BLUEPRINT READING FOR PLUMBERS

SEWAGE DISPOSAL SYSTEM:

1. The high level of the finished grade around the house is to be at elevation 101.00' corresponding to elevations on the plot plan.

2. The invert of the house drain is to be 7" under the house footing at the point it passes under the footing.

3. The sewer line to the septic tank shall be 6" sewer tile laid at a grade of 1/8" per foot slope to the septic tank. The invert of the sewer tile at the septic tank inlet shall be at lease 1'6" below grade.

4. The septic tank shall have a minimum capacity of 1,000 gallons (per table 11-3 F.H.A. code) and shall conform to the Uniform Plumbing Code B-4 and F.H.A. Code 1103-6.

5. The sewer line from the septic tank to the distribution box shall be a tight sewer line of 6" vitrified tile pipe laid at a grade of 1/8" per foot.

6. The distribution box shall be a pre-cast concrete unit of size necessary to accommodate the inlet and outlets.

7. The seepage bed shall be 4" open joint tile with bends constructed of proper fittings and laid at a grade of 1" in 10' on a gravel bed of 6" minimum thickness. The openings between joints shall be no more than 1/4" and joints shall be protected to eliminate soil infiltration. John's Manville rigid pipe or equal may be substituted for tile as approved.

HOUSE DRAIN:

1. The main portion of the house drain shall be 4" extra heavy cast iron. Branches from the house drain to the base of waste stacks may be 3" size if permitted by code. The house drain shall be water tight. It shall be on a grade not less than 1/8" per foot. Bends of 90^{0} are not acceptable.

SOIL STACK AND VENT PIPING:

1. The soil stack and branches shall be installed according to local code. The main stack shall be 4" size.

2. The waste stack size for the kitchen shall be 1½". The vent stack shall be 1½" unless otherwise specified in local code and shall extend 24" above the roof. The vent stack must increase one pipe size 6" before extending through the roof.

3. The waste and vent stacks for the bathrooms shall conform to local codes.

HOT AND COLD WATER PIPING:

1. The water shall be supplied by the artesian well. The pump shall be a three-phase jet pump with a 25FPM rate. An 80 gallon pressurized storage tank shall be provided.

2. All hot and cold water piping shall be type L copper with sweated fittings. The pipe will be adequately supported to prevent sagging and vibration. The pipe will be of adequate size for the service. Piping shall be run as directly as possible. It shall be graded to provide adequate draining.

3. Compression stop and waste valves shall be installed so that each: bath, kitchen sink, and the laundry, may be controlled for repair without shutting off other parts of the system.

4. Three (3) hose bibbs will be installed. Each bibb will have a stop and waste valve located in the basement. Bibb locations are inside the garage, near the front walk, and near the center of the total length at the rear of the house.

5. Hot water shall be supplied by a 60 gallon 3,000 watt water heater. Provisions shall be made for the installation of a water softener.

GAS PIPING:

1. Although gas is not used in the house at the present, gas piping will be installed to provide the following services. A hot water heater, the heating boiler, the kitchen range and a log lighter for each fireplace.

2. Gas piping shall be black steel pipe with threaded fittings installed per NFPA Standard #54.

3. The following sizes are required:

   a. 1" main from the meter in the pump room to the boiler.
   b. 3/4" branch to the kitchen range.
   c. The other outlets may terminate in 1/2" size with 3/4" size for branches with more than one outlet or more than 10' run.

HEATING:

1. Heating shall be provided by a hot water boiler system. The boiler shall be oil fired and capable of producing a gross output of 150,000 BTU.

2. Heat transfer shall be affected through baseboard heaters. Piping shall be 1/2" type L copper tubing with sweat soldered connections. The baseboard shall be positioned as shown in the plans.

FLOOR AND FOOTING DRAINAGE:

1. Drainage for the footings and garage floor shall be provided to meet local codes. A dry well located at the corner of the garden plot will receive this drainage.

File Code: 79.02.05.00.A2-1

Date Published: 1/6/76

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Experience Guide

UNIT: BLUEPRINT READING FOR SHEET METAL

RATIONALE:

Along with skills in the sheet metal shop, the sheet metal worker needs to be able to follow plans for the things that he makes. This unit introduces the student of sheet metal to methods of obtaining the information from prints needed to fabricate sheet metal items.

PREREQUISITES:

1. Communications Skills at or above Level G.
2. Math Skills at or above Level 1.

RESOURCES:

Printed Materials

Sheet Metal Blueprint Reading for the Building Trades. Delmar Publishers.

Equipment

Compass
Dividers
Scale, architect
Protractor
Triangles (30^{o} x 60^{o} & 45^{o})

OBJECTIVE:

Obtain and interpret information from blueprints for application to sheet metal duct systems used in heating and ventilating.

GENERAL INSTRUCTIONS:

This unit consists of 33 Learning Activity Packages (LAPs). Each LAP will provide specific information for completion of a learning activity.

Principal Author(s): C. Schramm

General Instructions: Continued

The general procedure for this unit is as follows:

(1) Read the first assigned Learning Activity Package (LAP).
(2) Begin and complete the first assigned LAP.
(3) Proceed to and complete the next assigned LAP until the unit is completed.
(4) Take the unit tests as described in the Unit LEG "Evaluation Procedures".

PERFORMANCE ACTIVITIES:

.01 Inch Rules and Fractional Divisions
.02 Inch Rules and Decimal Divisions
.03 Architectual Scale
.04 The Protractor
.05 The Dividers
.06 Review of Linear and Angular Measure
.07 Orthographic Projection
.08 Architectural Drawings
.09 Sheet Metal Drawing
.10 Architectural Drafting Symbols
.11 Plumbing Symbols
.12 Electrical Symbols
.13 Welding Symbols
.14 Sheet Metal Symbols
.15 Shop Methods
.16 Material
.17 Estimating Methods
.18 Sheet Metal Fittings
.19 Roofing and Flashing
.20 Gutters, Downspouts and Ventilators
.21 Metal Decking
.22 Vee Belt Guard-Removable Cover-Junction Box
.23 Warm-Air Heating Systems
.24 Heating Plans
.25 Project Home-Residential Home
.26 Ventilation Systems
.27 Industrial Ventilation System
.28 Multizone Ventilation Systems
.29 Air-Conditioning Systems
.30 A Multiduct Air-Conditioning System
.31 A Motel Air-Conditioning System
.32 Exhaust Systems
.33 Grinding Exhaust-Sash and Door G

EVALUATION PROCEDURE:

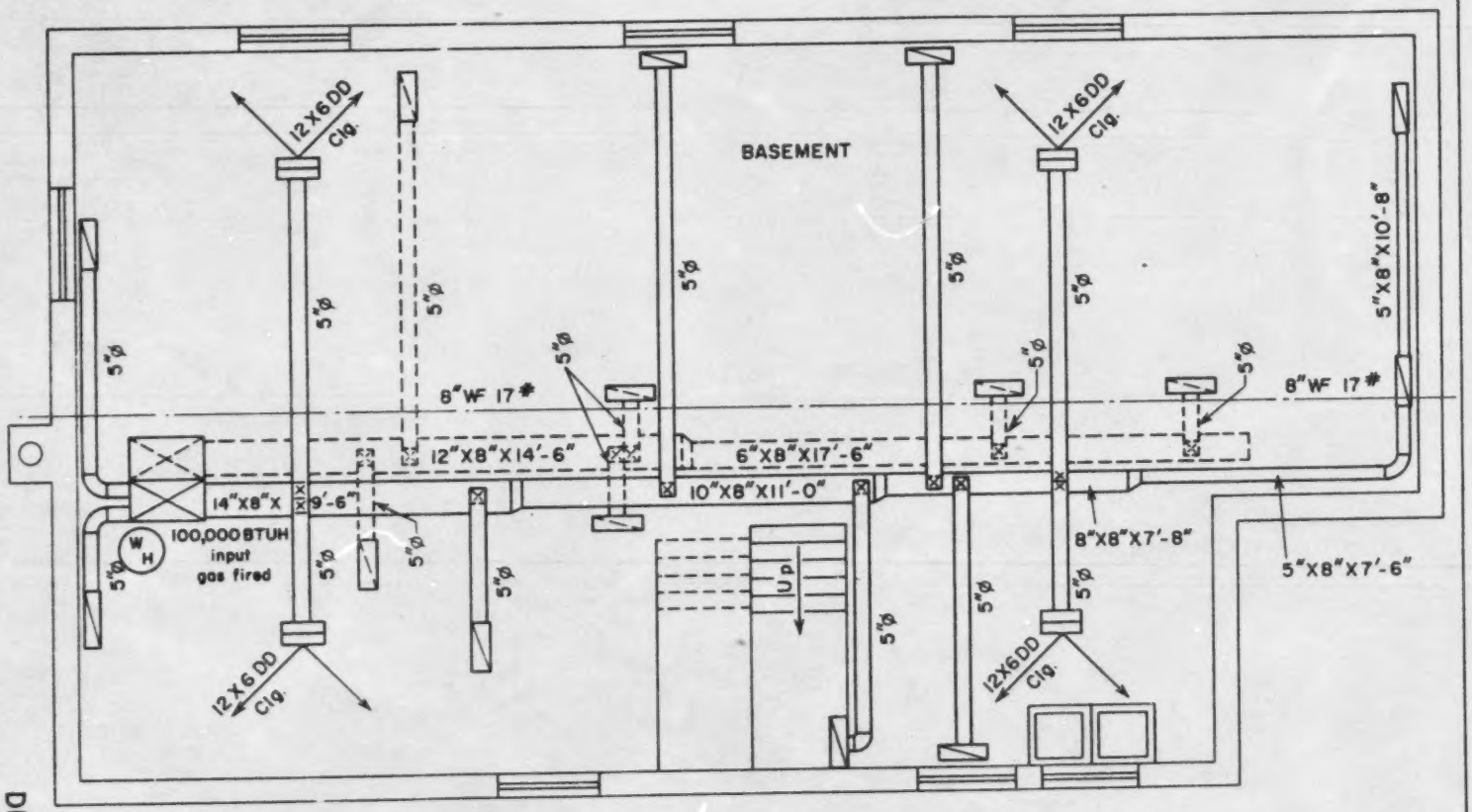
When pretesting and post testing:

The student takes the unit multiple-choice pretest.

Successful completion is 4 out of 5 items for each LAP part of the pretest.

FOLLOW-THROUGH:

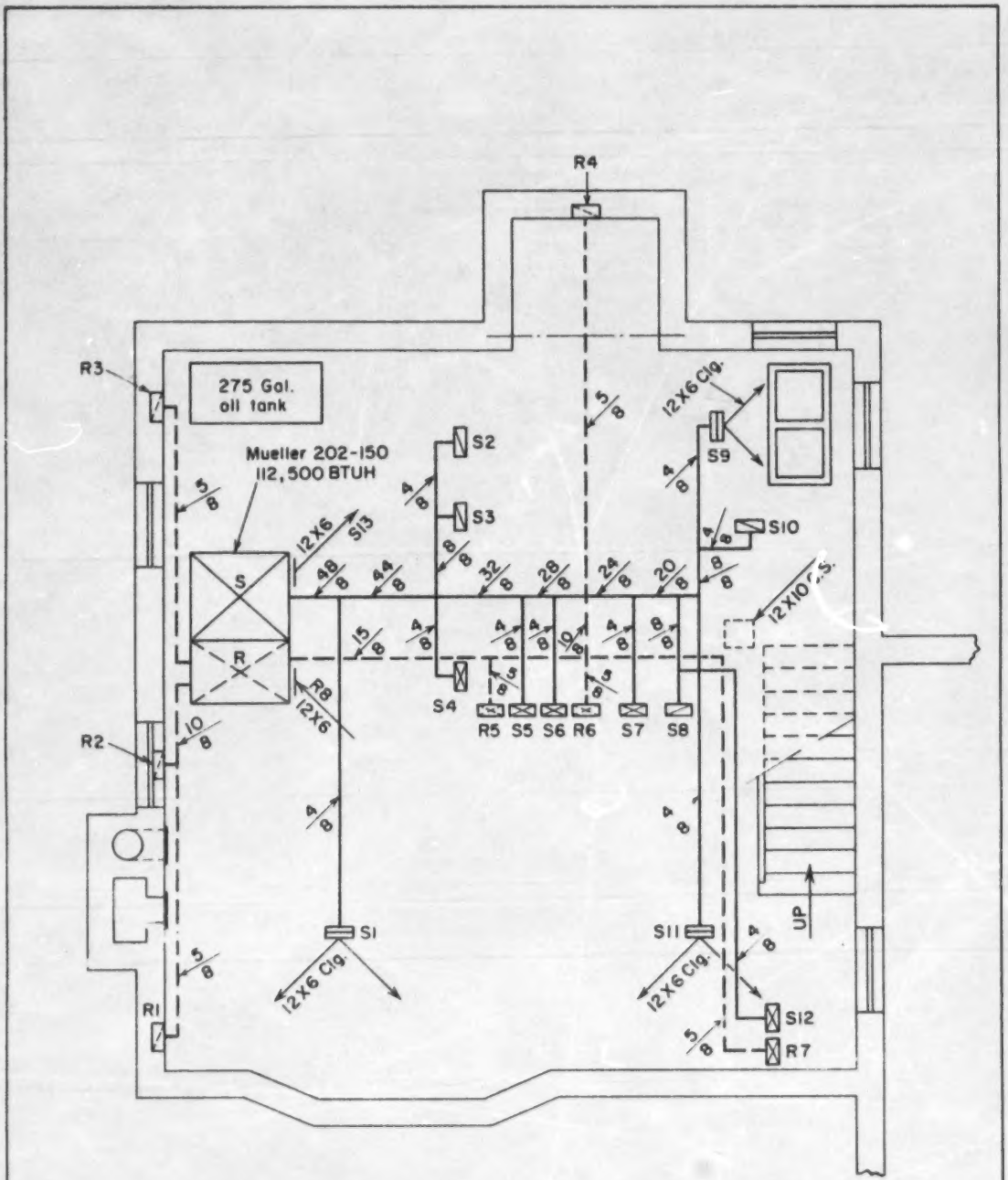
Begin working now on the first LAP of this unit.



FOUNDATION PLAN

Scale $\frac{3}{16}$" = 1'-0"

DRAWING NO. 26-2 SHEET 1



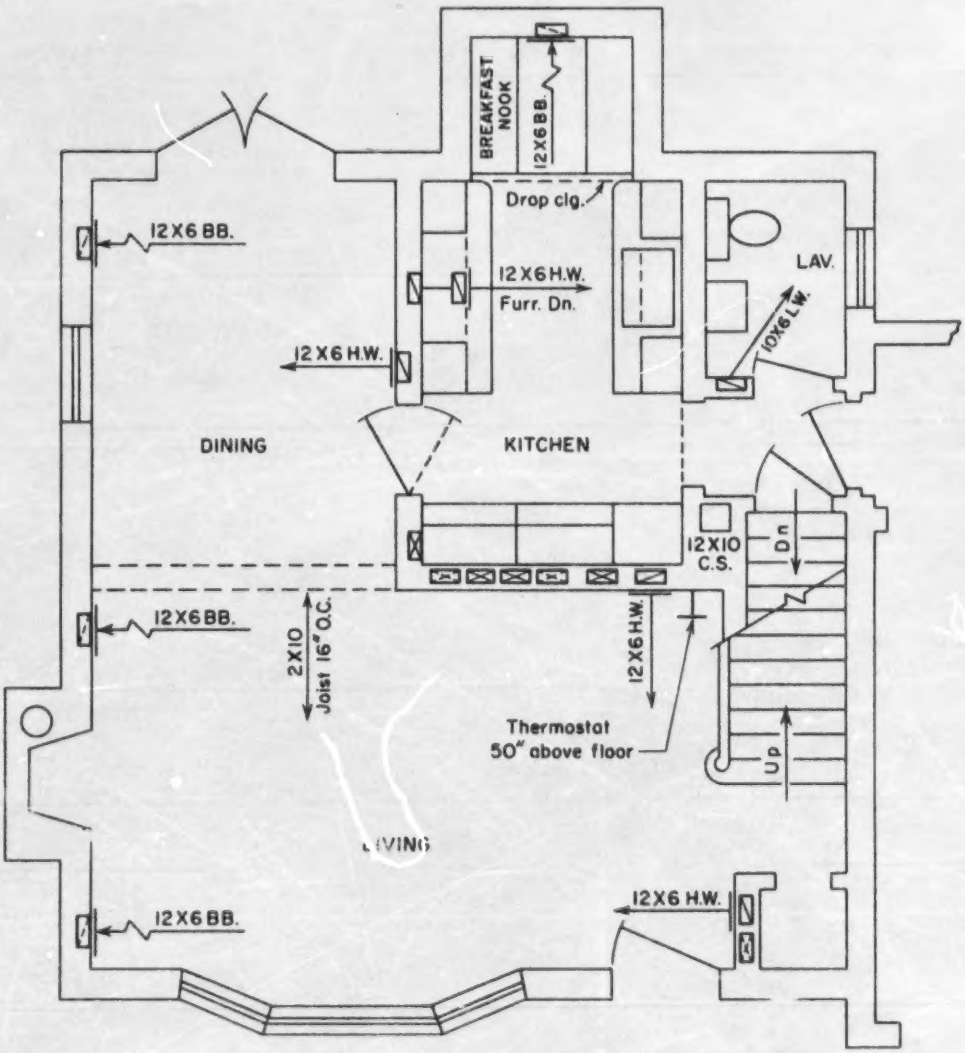
BASEMENT PLAN

Scale $\frac{3}{16}$" = 1'-0"

DRAWING NO.

26-1

SHEET 1

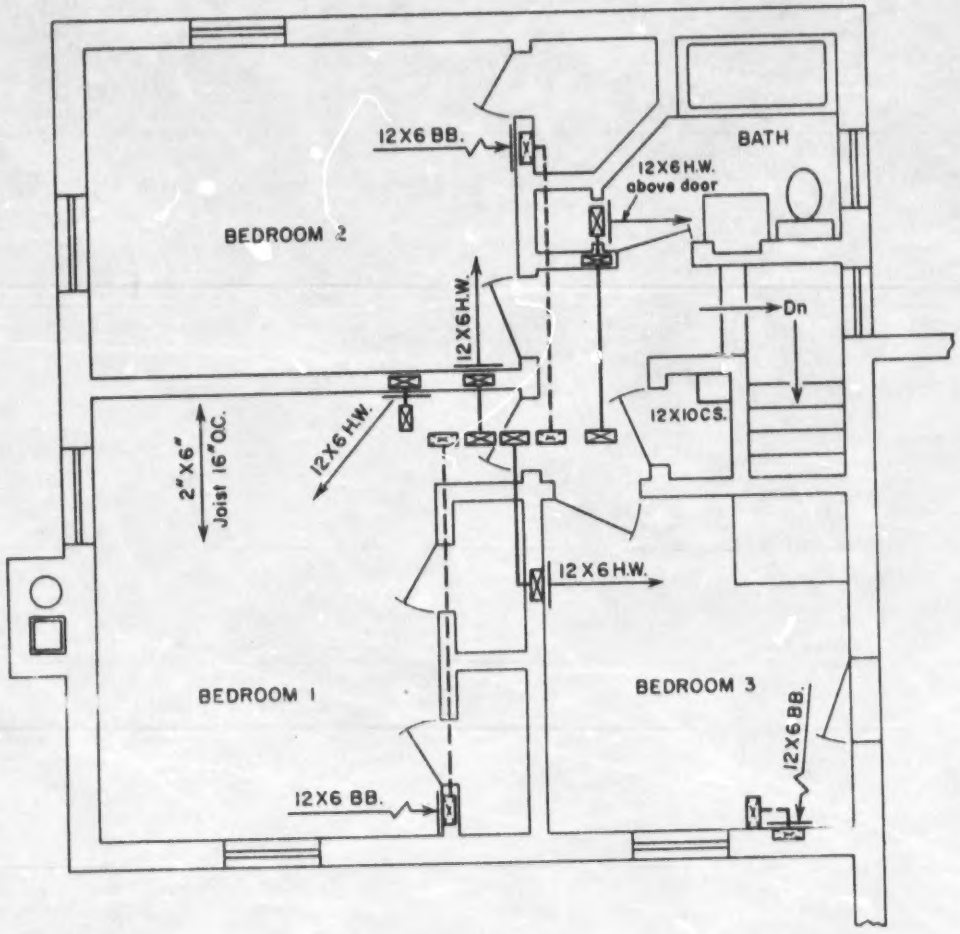


FIRST FLOOR PLAN

Scale $\frac{3}{16}$" = 1'-0"

H.W. 6'-6" above floor

DRAWING NO.
26-1
SHEET 2



SECOND FLOOR PLAN

Scale $\frac{3}{16}$" = 1'-0"

DRAWING NO.
26-1
SHEET 3

Student: _____ File Code: 79.02.05.00.A2-2

Date: _____ Date Published: 11-7-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

UNIT TEST: BLUEPRINT READING FOR SHEET METAL

1. In Figure 1, representing an architect's scale, measurement A is which of the following when 1/8" = 1'? (See diagram below)

   a. 7'
   b. 19'-4"
   c. 7' 4"
   d. 6' 8"

2. In Figure 1, measurement B is which of the following when 1/4" = 1'? (See diagram below)

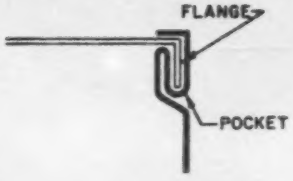
   a. 4' 6"
   b. 35' 5"
   c. 5' 5"
   d. 5' 6"

3. In Figure 2, (above), also representing an architect's scale, measurement A is which of the following when 1/2" = 1'?

   a. 1' 1½"
   b. 4' 1½"
   c. 4' 3"
   d. 1' 3"

4. Figure 3 represents what type of sheet metal seam?

   a. Pittsburgh lock
   b. Riveted lap seam
   c. Grooved lock seam
   d. Double seam



5. Figure 4 represents what type of sheet metal seam?

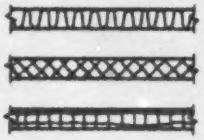
   a. standing seam
   b. drive cleat
   c. set-in bottom seam
   d. "S" cleat

6. Figure 5 represents which type of sheet metal seam?

   a. angle cleat
   b. bar cleat
   c. alternate bar cleat
   d. reinforced bar cleat

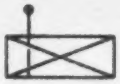
7. Figure 6 represents what type of building material?

a. concrete
b. brick
c. insulation
d. plaster



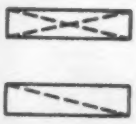
8. Figure 7 is what sheet metal ductwork symbol?

a. damper deflecting
b. damper automatic
c. damper deflecting up
d. damper volume



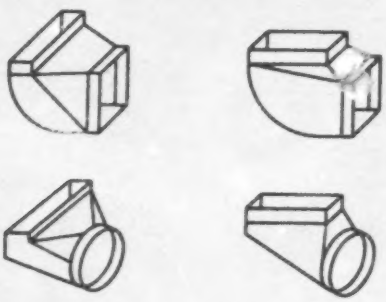
9. Figure 8 is what sheet metal ductwork symbol?

a. duct connection below joist
b. duct flow direction
c. duct section supply.
d. duct section exhaust, return



10. Figure 9 represents what type of sheet metal fittings?

a. plenums
b. boots
c. plenum take-offs
d. trunk duct take-offs

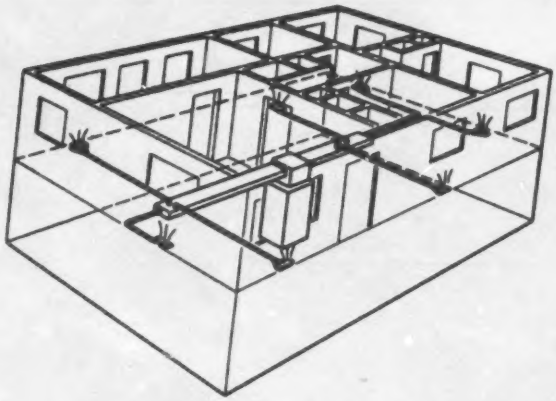


11. Figure 10 represents which sheet metal fitting?

a. elbow, square throat.
b. change elbow
c. angle
d. transition

12. Figure 11 represents which type of warm-air heating system?

    a. crawl space installation
    b. radial perimeter
    c. extended plenum system
    d. graduated trunk system



13. In a warm-air heating system, which of the following is considered to be the finest of all systems?

    a. extended plenum system
    b. graduated trunk system
    c. crawl space installation
    d. radial perimeter

14. In a warm-air heating system, using a crawl space as a plenum:

    a. duct work must be graduated
    b. it is necessary to run ductwork
    c. space between the floor joists is often used as part of the supply air system.
    d. the space used must be air-tight

15. When installing a year-round air-conditioning system, both heating and cooling, at which of the following locations should the supply registers be placed?

    a. ceiling
    b. floor
    c. low-wall
    d. high-wall

16. Which of the following 2 types of warm-air systems could be used in a building constructed on a concrete slab?

    a. extended and graduated
    b. loop and radial
    c. adjustable and graduated
    d. fixed and extended

QUESTIONS 17-30 REFER TO DRAWINGS 26-1 (3 sheets) and 26-2

17. What walls are used for warm air supply?

    a. interior walls
    b. exterior walls
    c. partition walls
    d. high wall

18. What size furnace is used?

    a. 150,000 BTUH
    b. 60,000 BTUH
    c. 100,000 BTUH
    d. 125,000 BTUH

19. What type of pipe is used for branch lines?

    a. oval pipe
    b. square pipe
    c. round pipe
    d. triangular pipe

20. What type of pipe is used for trunkline?

    a. oval pipe
    b. round pipe
    c. rectangular pipe
    d. triangular pipe

21. What size pipe is used for the branch line?

    a. 5" round pipe
    b. 8" round pipe
    c. 6" square pipe
    d. 4" square pipe

22. If volume dampers are used to adjust air flow, where should they be placed?

    a. in the register boot
    b. in the extended plenum
    c. in the cold air return
    d. in the branches

23. What size hot air registers are shown in the basement area?

    a. 12 x 8
    b. 10 x 6
    c. 14 x 8
    d. 12 x 6

24. What size is the supply pipe from the furnace to the first transition?

a. 14 x 8
b. 10 x 8
c. 10 x 6
d. 8 x 8

25. What size is the return trunkline pipe at the furnace?

a. 6 x 8
b. 10 x 8
c. 12 x 8
d. 14 x 8

26. How is the basement heated?

a. radiant heat from extended duct.
b. by 4 - 12 x 6 wall registers
c. radiant heat from the flue
d. warm return air to the furnace.

27. In order to finish the basement, the trunklines are?

a. made extra long.
b. kept close together.
c. placed far apart.
d. made at different levels.

28. When making a size reduction in a square trunkline, which fitting would you use?

a. transition
b. elbow
c. take-off
d. boot

29. What fitting is used to go from the main supply to the branch lines?

a. boot
b. transition
c. take-off
d. tee

30. Which room has a supply but no return?

a. living room
b. bedroom
c. kitchen
d. dining room

31. In what kind of heating system would it be difficult to install air conditioning?

a. forced air.
b. hydronic.
c. radiant.
d. gravity flow air.

32. Removable or electronic air filters are used for what purpose?

a. restrict the air flow
b. humidify
c. clean the air
d. increase the air flow

33. The best location in a room to introduce cold air is:

a. ceiling.
b. high wall.
c. low wall.
d. floor.

34. How many air changes per hour are satisfactory in home air conditioning?

a. 10
b. 4-6
c. 7-9
d. 3

QUESTIONS 35-50 REFER TO DRAWING 31

35. What is the opening size of the stack from unit A to the exterior?

a. 30" x 18"
b. 46" x 16"
c. 18" x 24"
d. 20" x 36"

36. What is the size of the duct from unit A to the filter banks in the kitchen hood?

a. 18" x 24"
b. 30" x 18"
c. 46" x 15"
d. 20" x 36"

37. What size louver is used on the fresh air intake on unit B?

a. 36" x 18"
b. 46" x 15"
c. 20" x 36"
d. 14" x 8"

38. What is the size of the change elbow that connects to the trunk line?

a. 36" x 18"
b. 15" x 18"
c. 46" x 15"
d. 20" x 36"

39. What are the opening sizes of the square throat change elbow in the supply line from unit C?

a. 16" x 45" to 24" x 30"
b. 40" x 13" to 20" x 28"
c. 45" x 13" to 8" x 16"
d. 20" x 10" to 16" x 8"

40. What size grills are used on the supply trunk line from unit C?

a. 24" x 16"
b. 40" x 36"
c. 18" x 24"
d. 45" x 16"

41. What size is the first section of the supply trunk line from unit C?

a. 24" x 30"
b. 45" x 13"
c. 45" x 16"
d. 40" x 36"

42. What size is the third section of the supply trunk line from unit C?

a. 24" x 26"
b. 24" x 24"
c. 24" x 30"
d. 20" x 5"

43. What branch size supplies the duct to the waiting area?

a. 24" x 5"
b. 14" x 8"
c. 22" x 5"
d. 15" x 5"

44. What plenum area is used to supply the four ceiling defusers in the waiting area?

a. 22" x 5"
b. 14" x 8"
c. 24" x 30"
d. 20" x 5"

45. The return trunk line to unit C is what size?

a. 24" x 30"
b. 45" x 13"
c. 24" x 25"
d. 40" x 36"

46. What is the return grill size for the return air next to the waiting area?

a. 18" x 24"
b. 30" x 14"
c. 40" x 36"
d. 46" x 15"

47. What is 2nd floor branch line size used from the return trunk line to Unit C?

    a. 18" x 24"
    b. 20" x 5"
    c. 20" x 10"
    d. 16" x 8"

48. The blueprint is drawn on what scale?

    a. 3/16" = 1'-0"
    b. 1/8" = 1'-0"
    c. 1/4" = 1'-0"
    d. 1/2" = 1'-0"

49. What is the BTU heating input of Unit C?

    a. 320,000 BTU
    b. 128,000 BTU
    c. 300,000 BTU
    d. -200,000 BTU

50. What is the CFM output of the fan in Unit A?

    a. 1500 DFM
    b. 4280 CFM
    c. 5000 CFM
    d. 6270 CFM